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Ambient Water Quality Criteria Recommendations

Information Supporting the Development of State and Tribal Nutrient Criteria

Lakes and Reservoirs in Nutrient Ecoregion III

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AMBIENT WATER QUALITY CRITERIA RECOMMENDATIONS

INFORMATION SUPPORTING THE DEVELOPMENT OF STATE AND TRIBAL NUTRIENT CRITERIA

FOR

LAKES AND RESERVOIRS IN NUTRIENT ECOREGION III

Xeric West

including all or parts of the States of:

Washington, Oregon, California, Nevada, Idaho, Wyoming, Montana, Utah, Colorado, New Mexico, Arizona, and Texas,

and the authorized Tribes within the Ecoregion

U.S. ENVIRONMENTAL PROTECTION AGENCY

OFFICE OF WATER
OFFICE OF SCIENCE AND TECHNOLOGY
HEALTH AND ECOLOGICAL CRITERIA DIVISION
WASHINGTON, DC

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FOREWORD

This document presents EPA's nutrient criteria for **Lakes and Reservoirs in Nutrient Ecoregion III**. These criteria provide EPA's recommendations to States and authorized Tribes for use in establishing their water quality standards consistent with section 303(c) of the Clean Water Act (CWA). Under section 303(c) of the CWA, States and authorized Tribes have the primary responsibility for adopting water quality standards as part of State or Tribal law or regulation. Federal regulations require State and Tribal standards to contain scientifically defensible water quality criteria that are protective of designated uses. EPA's recommended section 304(a) criteria are not laws or regulations; they are guidance that States and Tribes may use as a starting point in creating their own water quality standards.

The term "water quality criteria" is used in two sections of the CWA, section 304(a)(1) and section 303(c)(2). The term has a different impact in each section. On the one hand, in section 304, the term represents a scientific assessment of ecological and human health effects that EPA recommends to States and authorized Tribes for establishing water quality standards that ultimately provide a basis for controlling discharges or releases of pollutants or related parameters. On the other hand, in section 303, ambient water quality criteria are developed by States and Tribes as part of their water quality standards, to define the level of a pollutant (or in the case of nutrients, a condition) necessary to protect designated uses in ambient waters.

Quantified water quality criteria contained within State or Tribal water quality standards are essential to a water quality-based approach to pollution control. Whether expressed numerically or as quantified translations of narrative criteria within State or Tribal water quality standards, quantified criteria are critical for assessing attainment of designated uses and measuring progress toward meeting CWA goals.

EPA is developing section 304(a) water quality criteria for nutrients because States and Tribes consistently identify excessive levels of nutrients as a major reason that as many as half of the Nation's surface waters surveyed do not meet water quality objectives, such as full support of aquatic life. EPA expects to develop nutrient criteria that cover four major types of waterbodies—lakes and reservoirs, rivers and streams, estuarine and coastal areas, and wetlands—across 14 major ecoregions of the United States. EPA's section 304(a) criteria are intended to provide for the protection and propagation of aquatic life and recreation. To support the development of nutrient criteria, EPA has published and will continue to publish technical guidance manuals that describe a process for assessing nutrient conditions in the four waterbody types listed above.

EPA's section 304(a) water quality criteria for nutrients provide numeric water quality criteria and procedures to help establish quantified criteria within State or Tribal water quality standards. In the case of nutrients, EPA section 304(a) criteria establish values for causal variables (e.g., total nitrogen and total phosphorus) and response variables (e.g., Secchi depth and chlorophyll *a*). EPA believes that State and Tribal water quality standards need to include quantified endpoints for causal and response variables to provide sufficient protection of uses and to maintain downstream uses. These endpoints will most often be expressed as numeric water quality criteria or as procedures to translate a State or Tribal narrative criterion into a quantified endpoint.

States and authorized Tribes have several options in adopting these criteria. EPA recommends the following approaches, in order of preference:

1. Wherever possible, develop nutrient criteria that fully reflect local conditions and protect specific designated uses through the process described in EPA's technical guidance manuals for nutrient criteria development. Such criteria may be expressed either as numeric criteria or as procedures to translate a State or Tribal narrative criterion into a quantified endpoint in State or Tribal water quality standards.

2. Adopt EPA's section 304(a) water quality criteria for nutrients, either as numeric criteria or as procedures to translate a State or Tribal narrative nutrient criterion into a quantified endpoint.

3. Develop nutrient criteria protective of designated uses using other scientifically defensible methods and appropriate water quality data.

EPA developed the nutrient criteria recommendations in this document with the intent that they serve as a starting point for States and Tribes to develop more refined criteria, as appropriate, to reflect local conditions. The values presented in this document generally represent nutrient levels that protect against the adverse effects of nutrient overenrichment. They are based on the information that was available to the Agency at the time of this publication. EPA expects States and Tribes may have additional information and data that may be utilized in the refinement of these criteria. EPA offers to work with States and authorized Tribes to establish the necessary quantitative endpoints to reduce the excess nutrient inputs into our nation's waters and to prevent any further impairments.

Geoffrey H. Grubbs, Director
Office of Science and Technology

DISCLAIMER

This document provides technical guidance and recommendations to States, authorized Tribes, and other authorized jurisdictions to develop water quality criteria and water quality standards under the Clean Water Act (CWA) to protect against the adverse effects of nutrient overenrichment. Under the CWA, States and authorized Tribes are to establish water quality criteria to protect designated uses. State and Tribal decisionmakers retain the discretion to adopt approaches on a case-by-case basis that differ from this guidance when appropriate and scientifically defensible. Even though this document contains EPA's scientific recommendations regarding ambient concentrations of nutrients that will protect aquatic resource quality, it does not substitute for the CWA or EPA regulations, nor is it a regulation itself. Thus it cannot impose legally binding requirements on EPA, States, authorized Tribes, or the regulated community, and it might not apply to a particular situation or circumstance. EPA may change this guidance in the future.

EXECUTIVE SUMMARY

Nutrient Program Goals

EPA developed the National Strategy for the Development of Regional Nutrient Criteria (National Strategy) in June 1998. The strategy presents EPA's intentions to develop technical guidance manuals for four types of waters (lakes and reservoirs, rivers and streams, estuaries and coastal waters, and wetlands) and produce section 304(a) criteria for specific nutrient Ecoregions by the end of 2000. In addition, the Agency formed Regional Technical Assistance Groups (RTAGs), which include State and Tribal representatives working to develop more refined and localized nutrient criteria based on approaches described in the waterbody guidance manuals. This document presents EPA's current recommended criteria for total phosphorus (TP), total nitrogen (TN), chlorophyll *a*, and turbidity for lakes and reservoirs in Nutrient Ecoregion III (Xeric West), which were derived using the procedures described in the *Lakes and Reservoirs Nutrient Criteria Technical Guidance Manual* (U.S. EPA, 2000a).

EPA's ecoregional nutrient criteria address cultural eutrophication—the adverse effects of excess human-caused nutrient inputs. The criteria are empirically derived to represent surface waters that are minimally impacted by human activities and protective of aquatic life and recreational uses. The information contained in this document represents starting points for States and Tribes to develop (with assistance from EPA) more refined nutrient criteria.

In developing these criteria recommendations, EPA followed a process that included, to the extent they were readily available, the following critical elements:

- **Historical and recent nutrient data in Nutrient Ecoregion III.** Data sets from Legacy STORET, EPA Region 8 and Colorado Reservoir, EPA Region 10 were used to assess nutrient conditions from 1990 to 2000.

- **Reference sites/reference conditions in Nutrient Ecoregion III.** Reference conditions presented are based on 25th percentiles of all nutrient data, including a comparison of reference conditions for the Aggregate Ecoregion versus the subecoregions. States and Tribes are urged to determine their own reference sites for lakes and reservoirs at different geographic scales and to compare them to EPA's reference conditions.

- **Models employed for prediction or validation.** EPA did not identify any specific models to develop nutrient criteria. States and Tribes are encouraged to identify and apply appropriate models to support nutrient criteria development.

- **RTAG expert review and consensus.** EPA recommends that when States and Tribes prepare their nutrient criteria, they obtain the expert review and consent of the RTAG.

- **Downstream effects of criteria.** EPA encourages the RTAG to assess the potential effects of the proposed criteria on downstream water quality and uses.

In addition, EPA followed specific **QA/QC procedures** during data collection and analysis. All data were reviewed for duplications. All data were from ambient waters that were not located directly outside a permitted discharger. The following States indicated that their data were sampled and analyzed using either standard methods or EPA-approved methods: Washington, Oregon, Idaho, Wyoming, Montana, Utah, Colorado, Arizona, and Texas. California indicated that standard or EPA-approved methods were used for some specific nutrient parameters.

The following tables contain a summary of aggregate and level III Ecoregion values for TN, TP, water column chlorophyll *a*, and Secchi.

BASED ON 25th PERCENTILES ONLY

Nutrient Parameters	Aggregate Nutrient Ecoregion III Reference Conditions
Total phosphorus (µg/L)	17
Total nitrogen (mg/L) (reported)	0.40
Chlorophyll *a* (µg/L) (fluorometric method)	3.4
Secchi (m)	2.7

For subecoregions 6, 10, 12, 13, 14, 18, 20, 22, 24, 79, 80, and 81, the ranges of nutrient parameter reference conditions are as follows:

BASED ON 25th PERCENTILE ONLY

Nutrient Parameters	Range of Level III Subecoregions Reference Conditions
Total phosphorus (µg/L)	3-172*
Total nitrogen (mg/L) (calculated)	0.15-1.44
Chlorophyll *a* (µg/L) (fluorometric method)	0-24.6*
Secchi (m)	1.4-3.1

* This value appears inordinately high and may either be a statistical anomaly or reflect a unique condition. In any case, further regional investigation is indicated to determine the sources, i.e., measurement error, notational error, statistical anomaly, naturally enriched conditions, or cultural impacts.

NOTICE OF DOCUMENT AVAILABILITY

This document is available electronically to the public through the Internet at http://www.epa.gov/OST/standards/nutrient.html. Requests for hard copies of the document should be made to EPA's National Service Center for Environmental Publications (NSCEP), 11029 Kenwood Road, Cincinnati, OH 45242; telephone (513) 489-8190 or toll free (800) 490-9198. Please refer to EPA document number EPA-822-B-01-008.

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1.0 INTRODUCTION

Background

Nutrients are essential to the health and diversity of surface waters. However, in excessive amounts nutrients cause eutrophication or hypereutrophication, which results in overgrowth of plant life and decline of the biological community. Excessive nutrients can also result in human health risks, such as the growth of harmful algal blooms, most recently manifested in the *Pfiesteria* outbreaks on the Gulf and East Coasts. Chronic nutrient overenrichment of a waterbody can lead to the following consequences: algal blooms, low dissolved oxygen, fish kills, overabundance of macrophytes, likely increased sedimentation, and species shifts of both flora and fauna.

Historically, National Water Quality Inventories have repeatedly shown that nutrients are a major cause of ambient water quality use impairments. EPA's 1996 National Water Quality Inventory report identifies excessive nutrients as the leading cause of impairment in lakes and the second leading cause of impairment in rivers (behind siltation). In addition, nutrients were the second leading cause of impairments after siltation reported by the States in their 1998 lists of impaired waters. Where use impairment is documented, nutrients contribute roughly 25%-50% of the impairment nationally. The Clean Water Act (CWA) establishes that, wherever possible, water quality must provide for the protection and propagation of fish, shellfish, and wildlife, and recreation in and on the water and/or protecting the physical, chemical, and biological integrity of those waters. In adopting water quality standards, States and Tribes designate uses for their waters in consideration of these CWA goals, and establish water quality criteria that contain sufficient parameters to protect that integrity and those uses. To date, EPA has not published information and recommendations under section 304(a) for nutrients to assist States and Tribes in establishing numeric nutrient criteria to protect uses when adopting water quality standards.

In 1995, EPA gathered a set of national experts and asked them how best to deal with the national nutrient problem. The experts recommended that the Agency not develop single criteria values for phosphorus (P) or nitrogen (N) applicable to all waterbodies and regions of the country. Rather, they recommended that EPA put a premium on regionalization, develop guidance (assessment tools and control measures) for specific waterbodies and ecological regions across the country, and use reference conditions (conditions that reflect pristine or minimally impacted waters) as a basis for developing nutrient criteria.

With these suggestions as starting points, EPA developed the National Strategy for the Development of Regional Nutrient Criteria (National Strategy), published in June 1998. This strategy presented EPA's intentions to develop technical guidance manuals for four types of waters (lakes and reservoirs, rivers and streams, estuaries and coastal waters, and wetlands), and thereafter to publish section 304(a) criteria recommendations for specific nutrient Ecoregions. Technical guidance manuals for lakes/reservoirs and rivers/streams were published in April 2000 and July 2000, respectively. The technical guidance manual for estuaries/coastal waters was published in fall 2001, and the draft wetlands technical guidance manual will be published by December 2001. Each manual presents EPA's recommended approach for developing nutrient criteria values for a specific waterbody type. In addition, EPA is committed to working with

States and Tribes to develop more refined and localized nutrient criteria based on approaches described in the waterbody guidance manuals and this document.

Overview of the Nutrient Criteria Development Process

For each nutrient Ecoregion, EPA developed a set of recommendations for two causal variables (total nitrogen and total phosphorus) and two early indicator response variables (chlorophyll *a* [chl *a*] and Secchi). Other indicators such as dissolved oxygen, macrophyte or benthic algal growth or speciation, and other fauna and flora changes are also useful. However, the first four variables are considered to be the best suited for protecting designated uses.

The technical guidance manuals describe a process for developing nutrient criteria that involves consideration of five factors. The first of these is the Regional Technical Assistance Group (RTAG), which is a body of qualified regional specialists able to objectively evaluate all of the available evidence and select the value(s) appropriate to nutrient control in the water bodies of concern. These specialists may come from such disciplines as limnology, biology, or natural resources management—especially water resource management, chemistry, and ecology. The RTAG evaluates and recommends appropriate classification techniques, usually physical, for criteria determination within an ecoregional construct.

The second factor is the historical information available to establish a perspective of the resource base. This is usually data and anecdotal information available within the past 10-25 years. This information gives evidence about the background and enrichment trend of the resource.

The third factor is the existing reference condition, a selection of reference sites chosen to represent the least culturally impacted waters of the class at the present time. The data from these sites are combined and a value is selected to represent the reference condition, the best attainable, most natural condition of the resource base at this time.

The RTAG comprehensively evaluates these three elements to propose a candidate criterion (initially one each for TP, TN, chl *a*, and Secchi).

A fourth factor often employed is mechanistic or empirical models of the historical and reference condition data to better understand the condition of the resource.

The final element of the process is assessment by the RTAG of the likely downstream effects of the criterion. Will there be a negative, positive, or neutral effect on the downstream waterbody? If the RTAG judges that a negative effect is likely, then the proposed State/Tribal water quality criteria should be revised to ameliorate the potential for any adverse downstream effects.

Although States and authorized Tribes do not necessarily need to incorporate all five elements into their water quality criteria setting process (e.g., modeling may be significant in only some instances), the best assurance of a representative and effective criterion is a balanced incorporation of all five elements.

Because some parts of the country have naturally different soil and parent material nutrient content and different precipitation regimes, the application of the criterion development process should reflect this regional variation. Therefore, an ecoregional approach was chosen. Initially, the continental United States was divided into 14 separate Ecoregions of similar geographical characteristics and similar nutrient condition (Figure 1a). Ecoregions are defined as regions of relative homogeneity in ecological systems; they depict areas within which the mosaic of ecosystem components (biotic and abiotic as well as terrestrial and aquatic) is different from adjacent areas in a holistic sense. Geographic characteristics such as soils, vegetation, climate, geology, and land cover are relatively similar within each Ecoregion (Omernik, 2000).

The nutrient Ecoregions are aggregates of EPA's hierarchical level III Ecoregions (see Figure 1b for a map of level III Ecoregions). As such, they are more generalized and less defined than level III Ecoregions. EPA determined that setting ecoregional criteria for the large-scale aggregates is not without its drawbacks: variability is high because of the lumping of many waterbody classes, seasons, and years worth of multipurpose data over a large geographic area. For these reasons, the Agency recommends that States and Tribes develop nutrient criteria at the level III ecoregional scale and at the waterbody-class scale, where those data are readily available. Data analyses and recommendations on both the large Aggregate Ecoregion scale and the more refined scales (level III Ecoregions and waterbody classes), where data were available to make such assessments, are presented for comparison and completeness of analysis.

Comparison of Nutrient Criteria to Biological Criteria

Biological criteria are quantitative expressions of the desired condition of the aquatic community. Such criteria can be based on data from sites that represent the least impacted attainable condition for a particular waterbody type in an Ecoregion, subecoregion, or watershed. EPA's nutrient criteria recommendations and biological criteria recommendations have many similarities in their basic approaches to development and data requirements. Both are empirically derived from statistical analysis of field-collected data and expert evaluation of current reference conditions and historical information. Both use direct measurements from the environment to integrate the effects of complex processes that vary according to type and location of waterbody. The resulting criteria recommendations, in both cases, are efficient uses of existing resources and are holistic indicators of the water quality necessary to protect uses.

States and authorized Tribes can develop and apply nutrient and biological criteria in tandem, with each providing important and useful information to interpret both the nutrient enrichment levels and the biological condition of sampled waterbodies. For example, using the same reference sites for both types of criteria can lead to efficiencies in both sample design and data analysis. In one effort, environmental managers can obtain information to support assessment of biological and nutrient condition, either through evaluating existing data sets or through designing and conducting a common sampling program. The traditional biological criteria variables of benthic invertebrate and fish sampling can be readily incorporated in a nutrient assessment. To investigate the effectiveness of this tandem approach, EPA has initiated pilot projects in both freshwater and marine environments to pursue the relationship between nutrient overenrichment and apparent declines in diversity of benthic invertebrates and fish.

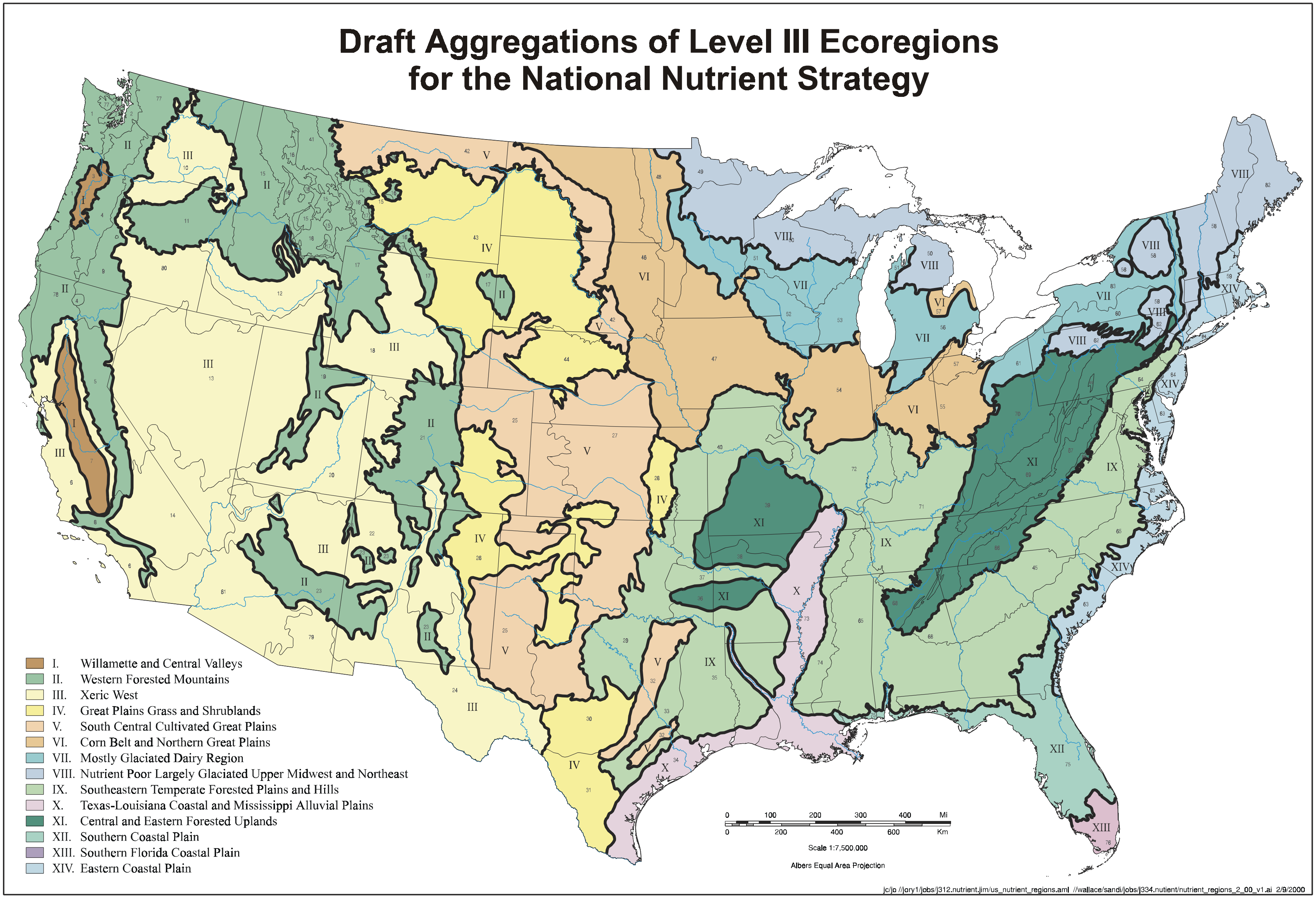


Figure 1a. Fourteen nutrient Ecoregions as delineated by Omernik (2000). Ecoregions were based on geology, land use, ecosystem type, and nutrient conditions.

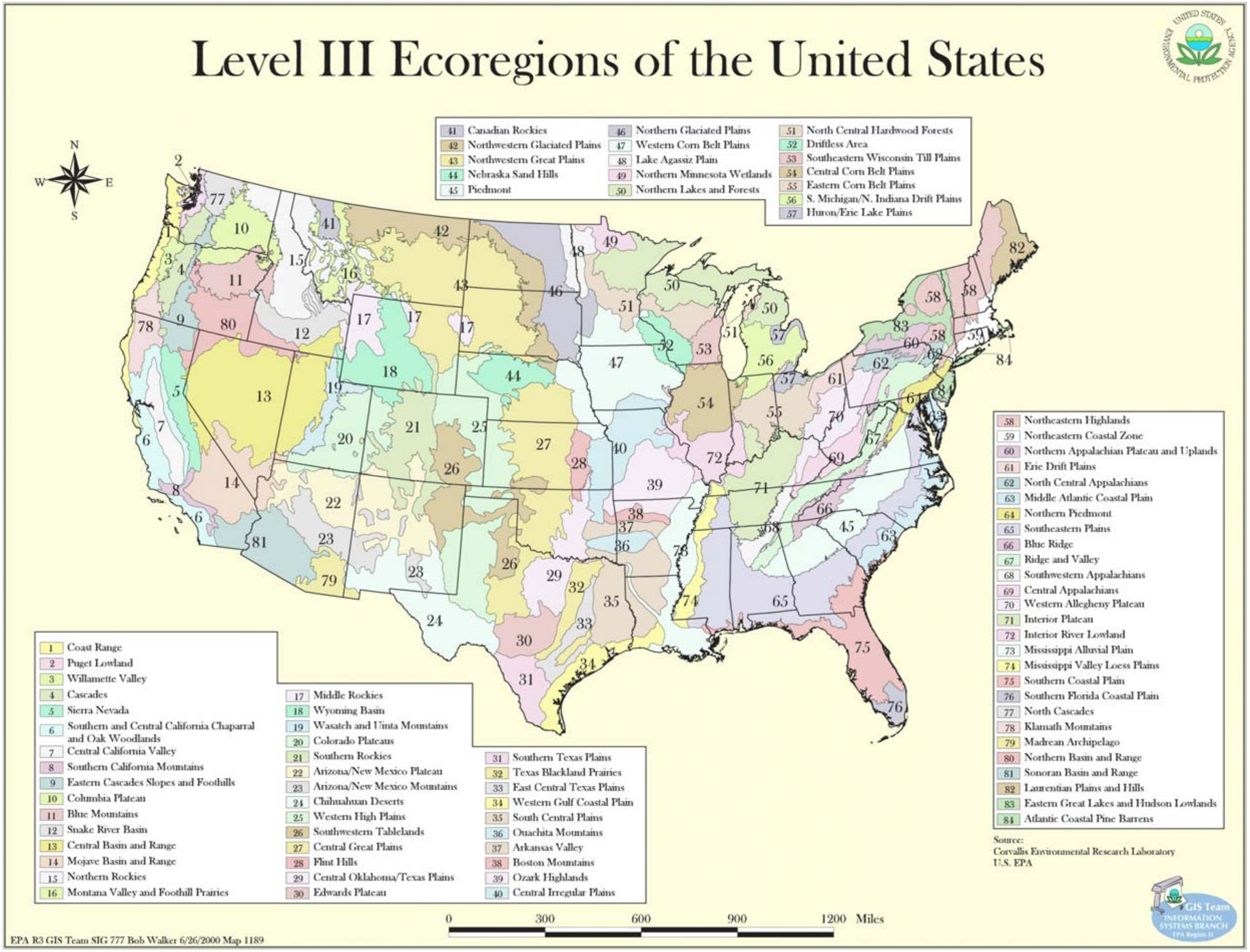


Figure 1b. Level III Ecoregions of the United States.

2.0 BEST USE OF THIS INFORMATION

EPA recommendations published under section 304(a) of the CWA serve several purposes, including providing guidance to States and Tribes in adopting water quality standards for nutrients and ultimately controlling discharges or releases of pollutants. The recommendations also provide guidance to EPA when it determines that it is necessary to promulgate Federal water quality standards under section 303(c). Other uses include identification of overenrichment problems, management planning, project evaluation, and determination of status and trends of water resources.

State water quality inventories and listings of impaired waters consistently rank nutrient overenrichment as a top contributor to use impairments. EPA's water quality standards regulations at 40 CFR §131.11(a) require States and Tribes to adopt criteria that contain sufficient parameters and constituents to protect the designated uses of their waters. In addition, States and Tribes need quantifiable targets for nutrients to assess attainment of uses, develop water quality-based permit limits and source control plans, and establish targets for total maximum daily loads (TMDLs).

EPA expects States and Tribes to address nutrient overenrichment in their water quality standards and to build on existing State and Tribal efforts where possible. States and Tribes can address nutrient overenrichment through establishment of numerical criteria or use of narrative criteria statements (e.g., "free from excess nutrients that cause or contribute to undesirable or nuisance aquatic life or produce adverse physiological response in humans, animals, or plants"). In the case of narrative criteria, EPA expects that States and Tribes will establish procedures to quantitatively translate these statements for both assessment and source control purposes.

Ecoregional nutrient criteria are developed to represent surface waters that are minimally impacted by human activities and thus protect against the adverse effects of nutrient overenrichment from cultural eutrophication. EPA's recommended process for developing such criteria includes physical classification of waterbodies, determination of current reference conditions, evaluation of historical data and other information (such as published literature), use of models to simulate physical and ecological processes or determine empirical relationships among causal and response variables (if necessary), expert judgment, and evaluation of downstream effects. EPA has used elements of this process to produce the information contained in this document. The causal (total nitrogen, total phosphorus) and biological and physical response (chlorophyll *a*, Secchi) variables represent a set of starting points for States and Tribes to use in establishing their own criteria.

EPA recommends that States and Tribes establish numerical criteria based on section 304(a) guidance, section 304(a) guidance modified to reflect site-specific conditions, or other scientifically defensible methods. For many pollutants, such as toxic chemicals, EPA expects that section 304(a) guidance will provide an appropriate level of protection without further modification. EPA has also published methods for modifying 304(a) criteria, such as the water effect ratio, on a site-specific basis where conditions warrant modification to achieve the intended level of protection. For nutrients, however, EPA expects that it will usually be necessary for States and authorized Tribes to be more precise in identifying the nutrient levels that protect aquatic life and recreational uses. This can be achieved through criteria modified to reflect a smaller geographic scale than an Ecoregion, such as a subecoregion, the State or Tribe level, or a specific class of waterbodies. Criteria can be refined by grouping data or performing analyses at these smaller geographic scales. Refinement can also occur through further consideration of other elements such as published literature or models.

EPA expects that the values presented in this document generally represent nutrient levels that protect against the adverse effects of cultural overenrichment and are based on information available to the Agency at the time of this publication. However, States and Tribes should critically evaluate this information in light of the specific uses that need to be protected. For example, more sensitive uses may require more stringent criteria to ensure adequate protection. On the other hand, overly stringent levels of protection against cultural eutrophication may actually fall below the natural load of nutrients for certain waterbodies. In cases such as these, the level of nutrients specified may not be sufficient to support a productive fishery. In the criteria derivation process, it is important to distinguish between the natural load associated with a specific waterbody using historical data and expert judgment and current reference conditions. These elements of the criteria derivation process are best addressed by States and Tribes with access to information and local expertise. Therefore, EPA strongly encourages States and Tribes to use the information contained in this document to develop more refined criteria according to the methods described in EPA's technical guidance manuals for specific waterbody types.

To assist in further refinement of nutrient criteria, EPA has established 10 RTAGs (experts from EPA Regional Offices and States/Tribes). In refining criteria, States and authorized Tribes need to provide documentation of data and analyses, along with a defensible rationale, for any new or revised nutrient criteria they submit to EPA for review and approval. As part of EPA's review of State and Tribal standards, EPA intends to seek assurance from the RTAG that proposed criteria are sufficient to protect uses.

In using the information and recommendations in this document and elsewhere to develop numerical criteria or procedures to translate narrative criteria, EPA encourages States and Tribes to:

- Address both chemical causal variables and early indicator response variables. Causal variables are necessary to protect uses before impairment occurs and to maintain downstream uses. Early response variables are necessary to warn of possible impairment and to integrate the effects of variable and potentially unmeasured nutrient loads.

- Include variables that can be measured to determine if standards are met, and variables that can be related to the ultimate sources of excess nutrients.

- Identify appropriate periods of duration (how long) and frequency (how often) of occurrence in addition to magnitude (how much). EPA does not recommend identifying nutrient concentrations that must be met at all times; rather a seasonal or annual averaging period (e.g., based on weekly or biweekly measurements) is considered appropriate. However, these central tendency measures should apply each season or each year, except under the most extraordinary conditions (e.g., a 100-year flood).

3.0 AREA COVERED BY THIS DOCUMENT

This chapter provides a general description of the Aggregate Ecoregion and its geographical boundaries. Descriptions of the level III subecoregions contained within the Aggregate Ecoregion are also provided.

3.1 Description of Aggregate Ecoregion III—Xeric West

The Xeric West is composed of unforested basins, alluvial fans, plateaus, buttes, and scattered mountains. Region III is drier than surrounding regions, and naturally occurring water is scarce in nearly all places. Its climate is subject to large year-to-year, seasonal, and diurnal variations. Perennial streams are rare and those that occur typically originate outside the region in the higher, wetter, more rugged Western Forested Mountains (II). Vegetation is often desertic, with areas of woodland occurring only locally in wetter locations. Most of the area is uncultivated and used for range. However, irrigated agriculture occurs where water is available and soils are suitable. In parts of the region, groundwater overdraft has lowered the water table, causing diminished spring flow/streamflow, saltwater intrusion (in coastal areas), and ground subsidence. Rivers that are heavily used for irrigation have high concentrations of dissolved solids, nitrite plus nitrate, and salinity that can increase downstream through irrigation return flow and evaporation. Areas of high human population density occur along with associated water quality problems including elevated levels of fecal coliform bacteria, nitrite plus nitrate, phosphorus, sulfate, and dissolved solids.

3.2 Geographical Boundaries of Aggregate Ecoregion III

Ecoregion III encompasses the areas of the western United States where dry conditions prevail (Figure 2). More specifically, the region includes central Washington, southeastern Oregon, and the southern third of Idaho. The entire State of Nevada is included in this region, as well as the vast majority of Utah (excluding the central mountainous region that is part of Ecoregion II). The region continues south to include the southeastern portion of California. The region also includes a U-shaped portion of California that starts up the central portion of the Pacific coast and then turns back southward around the central part of California included in Ecoregion I. From southern California, the region stretches east into Arizona, New Mexico, and a small area of southwest Texas. All of Arizona and New Mexico are included in Ecoregion III, with the exception of the mountainous areas that are part of Ecoregion II. In addition, extreme western Colorado and central Wyoming are included in this Ecoregion.

3.3 Level III Subecoregions Within Aggregate Ecoregion III

There are 12 level III subecoregions contained within Aggregate Ecoregion III (Figure 3). The following are brief descriptions provided by Omernik (1999) of the climate, vegetative cover, topography, and other ecological information pertaining to these subecoregions.

6. Southern and Central California Chaparral and Oak Woodlands

The primary distinguishing characteristic of this subecoregion is its Mediterranean climate of hot, dry summers and cool, moist winters, and associated vegetative cover comprising mainly

Figure 2. Aggregate Ecoregion III.

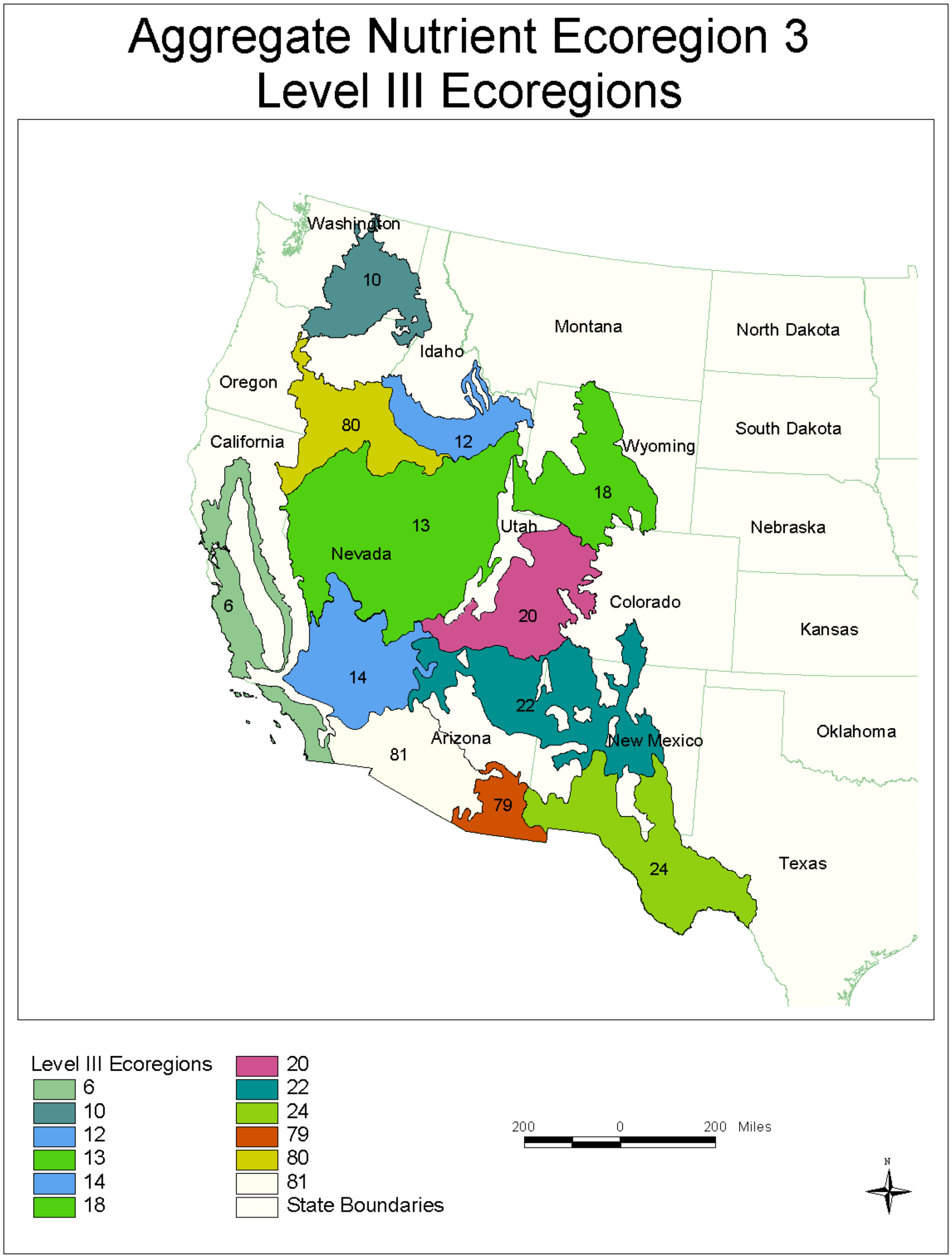


Figure 3. Aggregate Ecoregion III with level III Ecoregions shown.

chaparral and oak woodlands; grasslands occur in some lower elevations and patches of pine are found at higher elevations. Most of the region consists of open low mountains or foothills, but there are areas of irregular plains in the south and near the border of the adjacent Central California Valley Ecoregion. Much of this region is grazed by domestic livestock; very little land has been cultivated.

10. Columbia Plateau

The Columbia Plateau is an arid sagebrush steppe and grassland surrounded on all sides by moister, predominantly forested, mountainous ecological regions. This region is underlain by lava rock up to 2 miles thick and is covered in some places by loess soils that have been extensively cultivated for wheat, particularly in the eastern portions of the region where precipitation amounts are greater.

12. Snake River Basin

This portion of the xeric intermontane basin and range area of the western United States is considerably lower and more gently sloping than the surrounding subecoregions. Mostly because of the available water for irrigation, a large percentage of the alluvial valleys bordering the Snake River is devoted to agriculture, with sugar beets, potatoes, and vegetables being the principal crops. Cattle feedlots and dairy operations are also common in the river plain. Except for the scattered barren lava fields, the remainder of the plains and low hills in the subecoregion have a potential for natural vegetation in the form of sagebrush steppe and are now used for cattle grazing.

13. Central Basin and Range

The Central Basin and Range subecoregion is characterized by a mosaic of xeric basins, scattered low and high mountains, and salt flats. Compared with the Snake River Basin and Northern Basin and Range regions to the north, the region is hotter and contains higher dense mountains that have perennial streams and ponderosa pine forests at higher elevations. Also, there is less grassland and more shrubland, and the soils are mostly Aridisols rather than dry Mollisols. The region is not as hot as the Mojave and Sonoran Basin and Range subecoregions and it has a greater percentage of grazed land.

14. Mojave Basin and Range

This subecoregion contains scattered mountains that are generally lower than those of the Central Basin and Range. Potential natural vegetation in this region is predominantly creosote bush, compared with the mostly saltbush-greasewood and Great Basin sagebrush of the Ecoregion to the north, and creosote bush-bur sage with large patches of palo verde-cactus shrub and saguaro cactus in the Sonoran Basin and Range to the south. Most of this region is federally owned and there is relatively little grazing activity because of the lack of water and forage for livestock. Heavy use of off-road vehicles and motorcycles in some areas has caused severe wind and water erosion problems.

18. Wyoming Basin

This subecoregion is a broad intermontane basin dominated by arid grasslands and shrublands interrupted by high hills and low mountains. Nearly surrounded by forest-covered mountains, the region is somewhat drier than the Northwestern Great Plains to the northeast and does not have the extensive cover of pinyon-juniper woodland found in the Colorado Plateaus to the south. Much of the region is used for livestock grazing, although many areas lack sufficient vegetation to support this activity. The region contains major producing natural gas and petroleum fields.

20. Colorado Plateaus

Rugged tableland topography is typical of the Colorado Plateau subecoregion. Precipitous side-walls mark abrupt changes in local relief, often from 300 to 600 meters. The region is more elevated than the Wyoming Basin to the north and therefore contains a far greater extent of pinyon-juniper woodlands. However, the region also has large low-lying areas containing saltbrush-greasewood (typical of hotter, drier areas), which are generally not found in the higher Arizona/New Mexico Plateau to the south, where grasslands are common.

22. Arizona/New Mexico Plateau

The Arizona/New Mexico Plateau represents a large transitional region between the semiarid grasslands and low-relief tablelands of the Southwestern Tablelands subecoregion in the east, the drier shrublands and woodland-covered higher relief tablelands of the Colorado Plateau in the north, and the lower, hotter, less vegetated Mojave Basin and Range in the west and Chihuahuan Deserts in the south. Higher, more forest-covered, mountainous subecoregions border the region on the northeast and southwest. Local relief in the region varies from a few meters on plains and mesa tops to well over 300 meters along tableland side slopes.

24. Chihuahuan Deserts

This desertic subecoregion extends from the Madrean Archipelago in southeastern Arizona to the Edwards Plateau in south-central Texas. The region comprises broad basins and valleys bordered by sloping alluvial fans and terraces. Isolated mesas and mountains are located in the central and western parts of the region. Vegetative cover is predominantly arid grass and shrubland, except on the higher mountains where oak-juniper woodlands occur.

79. Madrean Archipelago

Also known as the Sky Islands in the United States, this is a region of basins and ranges with medium to high local relief, typically 1,000 to 1,500 meters. Native vegetation in the region is mostly grama-tobosa shrubsteppe in the basins and oak-juniper woodlands on the ranges, except at higher elevations where ponderosa pine is predominant. The region has ecological significance as both a barrier and a bridge between two major cordilleras of North America, the Rocky Mountains and the Sierra Madre Occidental.

80. Northern Basin and Range

This subecoregion consists of arid tablelands, intermontane basins, dissected lava plains, and widely scattered low mountains. The bulk of the region is covered by sagebrush steppe vegetation. The subecoregion is drier and less suitable for agriculture than the Columbia Plateau, is higher and cooler than the Snake River Basin to the east, and contains a lower density of mountain ranges than the adjacent Central Basin and Range subecoregion to the south. Much of the region is used as rangeland.

81. Sonoran Basin and Range

Similar to the Mojave Basin and Range to the north, this subecoregion contains scattered low mountains and has large tracts of federally owned land, most of which is used for military training. However, the Sonoran Basin and Range is slightly hotter than the Mojave and contains large areas of palo verde-cactus shrub and giant saguaro cactus, whereas the potential natural vegetation in the Mojave is largely creosote bush.

3.4 Suggested Ecoregional Subdivisions or Adjustments

EPA recommends that the RTAG evaluate the adequacy of EPA nutrient ecoregional and subecoregional boundaries and refine them as needed to reflect local conditions. See the paper by Dale Robertson (USGS, 2001b) for an alternative approach to Ecoregions entitled "An Alternative Regarding the Scheme for Defining Nutrient Criteria for Rivers and Streams."

4.0 DATA REVIEW FOR LAKES AND RESERVOIRS IN AGGREGATE ECOREGION III

This section describes the nutrient data EPA has collected and analyzed for this Ecoregion, including an assessment of data quantity and quality. The data tables present the data for each causal parameter (total phosphorus and total nitrogen, both reported and calculated from TKN and nitrite/nitrate) and the primary response variables (Secchi and chlorophyll *a*). EPA considers these parameters essential to nutrient assessment, because the first two are the main causative agents of enrichment and the two response variables are the early indicators of enrichment for most surface waters (see Chapter 5 of the *Lakes and Reservoirs Nutrient Criteria Technical Guidance Manual* [U.S. EPA, 2000a] for a complete discussion on choosing causal and response variables).

4.1 Data Sources

Data sets from Legacy STORET, EPA Region 10, and EPA Region 8-Colorado Reservoir were used to assess nutrient conditions from 1990 to 2000. EPA recommends that the RTAGs identify additional data sources that can be used to supplement the data sets listed above. In addition, the RTAGs may utilize published literature values to support quantitative and qualitative analyses.

4.2 Historical Data from Aggregate Ecoregion III (TP, TN, chl *a*, and Secchi)

EPA recommends that States/Tribes assess long-term trends observed over the past 50 years to assess the relative stability of the systems. This information may be obtained from scientific literature or documentation of historical trends. To gain additional perspective on more recent trends, it is recommended that States and Tribes assess nutrient trends over the past 10 years (e.g., what do seasonal variations indicate?).

4.3 QA/QC of Data Sources

An initial quality screen of data was conducted using the rules presented in Appendix C. Data remaining after screening for duplications and other QA measures (e.g., poor or unreported analytical records, sampling errors or omissions, stations associated with outfalls, stormwater sewers, hazardous waste sites) were used in the statistical analyses.

States within Ecoregion III were contacted regarding the quality of their data and information on the methods used to sample and analyze their waters. The following States indicated standard methods or approved EPA methods were used: Washington, Oregon, Idaho, Wyoming, Montana, Utah, Colorado, Arizona, and Texas. California indicated that standard or EPA-approved methods were used for some specific nutrient parameters. New Mexico did not provide information prior to the publication of this document.

4.4 Data for All Lakes and Reservoirs Within Aggregate Ecoregion III

Figure 4 shows the location of the sampling stations within each subecoregion. Table 1 presents all data records for all parameters for Aggregate Ecoregion III and subecoregions within the Aggregate Ecoregion.

4.5 Statistical Analysis of Data

EPA's *Technical Guidance Manual for Developing Nutrient Criteria for Lakes and Reservoirs* describes two ways of establishing a reference condition. One method is to choose the upper 25th percentile (75th percentile) of a reference population of lakes. This is the preferred method. The 75th percentile is preferred by EPA because it is likely associated with minimally impacted conditions, will be protective of designated uses, and provides management flexibility. When reference lakes are not identified, the second method is to determine the lower 25th percentile of the population of all lakes within a region to attempt to approximate the preferred approach. The 25th percentile of the entire population was chosen by EPA to represent a surrogate for an actual reference population. Data analyses to date indicate that the lower 25th percentile from an entire population roughly approximates the 75th percentile for a reference population (see case studies for Minnesota lakes in the *Lakes and Reservoirs Nutrient Criteria Technical Guidance Document* [U.S. EPA, 2000a], the case study for Tennessee streams in the *Rivers and Streams Nutrient Criteria Technical Guidance Document* [U.S. EPA, 2000b], the letter from Tennessee Department of Environment and Conservation to Geoffrey Grubbs [TNDEC, 2000], the unpublished paper titled "Estimating the Natural Background Concentrations of Nutrients in Streams and Rivers of the Conterminous United States" [USGS, 2001], and the letter from Matthew Liebman, U.S. EPA Region 1 Nutrient Criteria Coordinator,

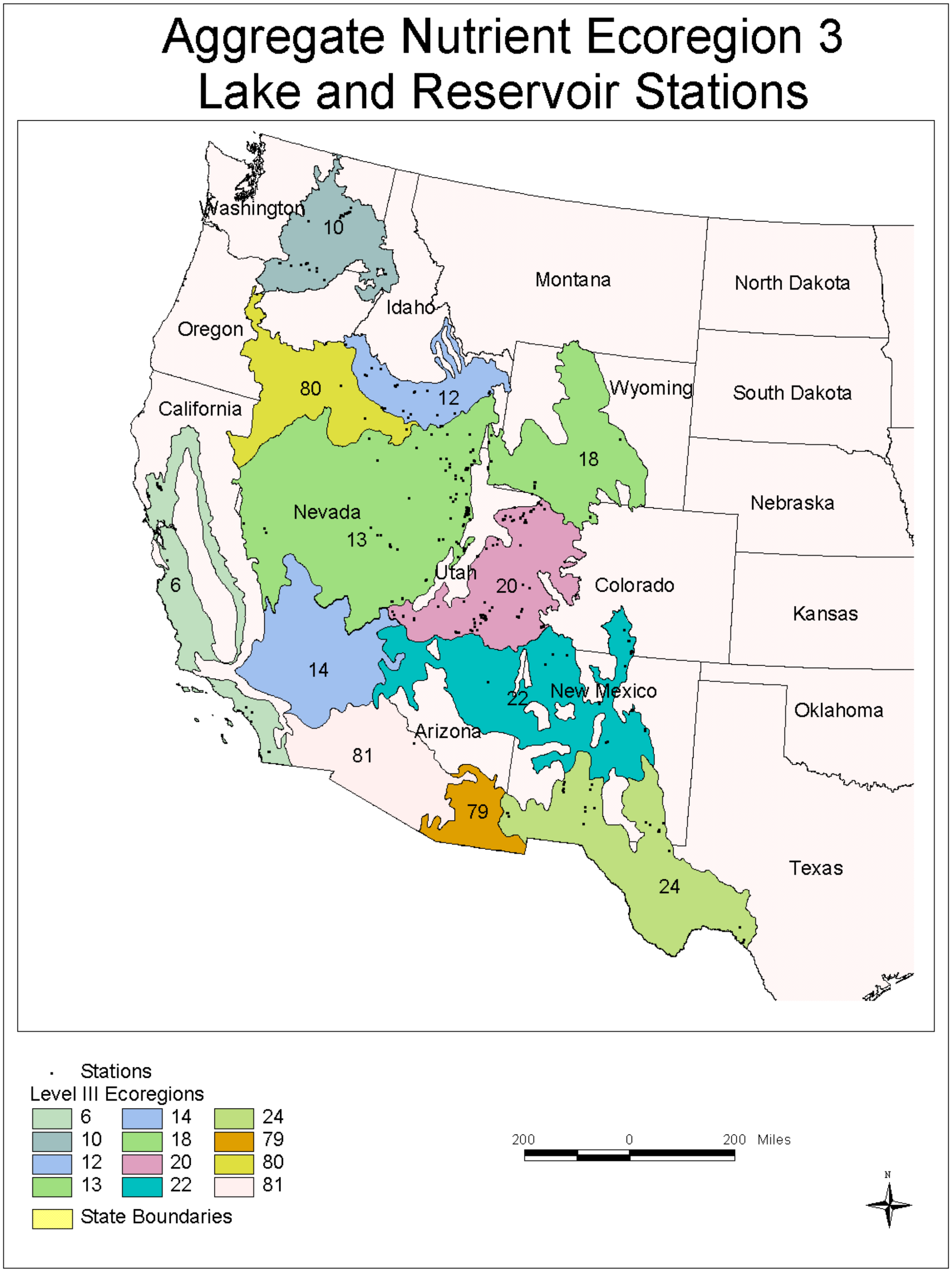


Figure 4. Sampling locations within each level III Ecoregion.

Table 1. Lake and reservoir records* for Aggregate Ecoregion III — Xeric West

	Aggregate Ecoregion III	Sub ecoR 6	Sub ecoR 10	Sub ecoR 12	Sub ecoR 13	Sub ecoR 18	Sub ecoR 20	Sub ecoR 22	Sub ecoR 24	Sub ecoR 80	Sub ecoR 81
# of lakes	190	9	17	18	50	11	40	17	19	8	1
# of lake stations	378	35	33	27	96	22	93	32	30	9	1
Key nutrient parameters (listed below)											
- # of records for Secchi depth	1,699	22	267	50	603	100	486	42	114	9	6
- # of records for chlorophyll a (all methods)	1,674	23	194	50	637	66	505	65	104	30	—
- # of records for total Kjeldhal nitrogen (TKN)	1,966	37	215	138	755	40	596	53	70	58	4
- # of records for nitrite + nitrate (NO_2+NO_3)	959	25	605	76	56	1	33	56	57	46	4
- # of records for total nitrogen (TN)	668	—	489	—	103	—	—	43	33	—	—
- # of records for total phosphorus (TP)	4,080	192	712	178	1,355	197	1,181	74	126	61	4
Total # of records for key nutrient parameters	11,046	299	2,482	492	3,509	404	2,801	333	504	204	18

Definitions: (1) # of records refers to the total count of observations for that parameter over the entire decade (1990-1999) for that particular aggregate or subecoregion. These are counts for all seasons over that decade. (2) # of lake stations refers to the total number of lake and reservoir stations within the aggregate or subecoregion from which nutrient data were collected. Since lakes and reservoirs can cross ecoregional boundaries, it is important to note that only those portions of a lake or reservoir (and data associated with those stations) that exist within the Ecoregion are included within this table.

*The number of lakes presented in this table is based on the number of lakes and reservoirs for which nutrient data were provided in the National Nutrient database. This does not imply that this is the total of lakes within the Ecoregion. States and Tribes should determine the representativeness of the tabular data by comparing this information with any additional material they may have.

to Geoffrey Grubbs [U.S. EPA, 2000c]). New York State has also presented evidence that the 25th percentile and the 75th percentile compare well based on user perceptions of water resources (NYSDEC, 2000).

Tables 2 and 3a-j present potential reference conditions for both the Aggregate Ecoregion and the subecoregions using both methods. However, the reference lake column is left blank because EPA does not have reference data and anticipates that States/Tribes will provide information on reference lakes. Tables 3a-j present potential reference conditions for lakes and reservoirs in the level III subecoregions within the Aggregate Ecoregion. Note that the footnotes for Table 2 apply to Tables 3a-j. Appendixes A and B provide a complete presentation of all descriptive statistics for both the Aggregate Ecoregion and the level III subecoregions.

Table 4 is presented for comparison purposes. It allows the reader to determine where, in the trophic state, the recommended reference conditions fall within traditionally viewed trophic boundaries.

4.6 Classification of Lake/Reservoir Type

Assessing the data by lake type should further reduce the variability in the data analysis. There were no readily available classification data in the national datasets used to develop these criteria. States and Tribes are strongly encouraged to classify their lakes before developing a final criterion.

4.7 Summary of Data Reduction Methods

All descriptive statistics were calculated using the medians for each lake within **Ecoregion III** for which data existed. For example, if one lake had 300 observations for phosphorus over the decade or 1 year's time, one median resulted. Each median from each lake was then used in calculating the percentiles for phosphorus for the aggregate nutrient Ecoregion/subecoregion (level III Ecoregion) by season and year (Figures 5a, 5b).

Preferred Data Choices and Recommendations When Data Are Missing

1. **Where data are missing** or are very low in total records for a given parameter, use 25th percentiles for parameters within an adjacent, similar subecoregion within the same aggregate nutrient Ecoregion, **or** when a similar subecoregion cannot be determined, use the 25th percentile for the Aggregate Ecoregion or consider the **lowest** 25th percentile from a subecoregion (level III) within the aggregate nutrient Ecoregion. Without data, one may assume that the subecoregion in question is as sensitive as the most sensitive subecoregion within the aggregate.

2. **TN calculated:** When reported total nitrogen (TN) median values are lacking or very low in comparison to TKN and Nitrate/Nitrite-N values, the medians for TKN and nitrite/nitrate-N are added, resulting in a calculated TN value. The number of samples (N) for calculated TN is not filled in because it is represented by two subsamples of data: TKN and nitrite/nitrate-N. Therefore, N/A is placed in this box.

Table 2. Reference conditions for Aggregate Ecoregion III lakes and reservoirs

Parameter	No. of lakes N*	Reported values		25th percentiles based on all seasons data for the decade	Reference lakes§
		Min	Max	P25† all seasons‡	P75 all seasons
TKN (mg/L)	122	0.00	3.07	0.30	
NO_2+NO_3-N (mg/L)	54	0.00	2.66	0.01	
TN (mg/L) - calculated				0.31	
TN (mg/L) - reported	26	0.17	2.37	0.40	
TP (µg/L)	170	1	1,000	17	
Secchi (m)	121	0.1	5.65	2.8	
Chlorophyll *a* (µg/L) - F	28	2.9	16	3.5	
Chlorophyll *a* (µg/L) - S	83	0.3	61.0	1.8	
Chlorophyll *a* (µg/L) - T	20 (z)	0.9	42.1	1.4	

* N = largest value reported for a decadal season. TN calculated is based on the sum of TKN + NO_2+NO_3. TN reported is actual TN value reported in the database for one sample.
† 75th percentile for Secchi.
‡ Median for all seasons' 25th percentiles, e.g., this value was calculated from four seasons' 25th percentiles. If the seasonal 25th percentile (P25) TP values are: spring 10 µg/L, summer 15 µg/L, fall 12 µg/L, and winter 5 µg/L, the median value of all seasons P25 will be 11µg/L.
§ As determined by the Regional Technical Assistance Groups (RTAGs).

Abbreviations: P25, 25th percentile of all data; P75, 75th percentile of all data; F, Chlorophyll *a* measured by Fluorometric method with acid correction; S, Chlorophyll *a* measured by Spectrophotometric method with acid correction; T, Chlorophyll *a b c* measured by Trichromatic method;—, not applicable.

Definitions: (1) Number of Lakes refers to the largest number of lakes and reservoirs for which data existed for a given season within an aggregate nutrient Ecoregion. (2) Medians. All values (min, max, and 25^{th} percentiles) included in the table are based on waterbody medians. All data for a particular parameter within a lake for the decade were reduced to one median for that lake. This prevents over-representation of individual waterbodies with a great deal of data versus those with fewer data points within the statistical analysis. (3) 25th percentile for all seasons is calculated by taking the median of the 4 seasonal 25^{th} percentiles. If a season is missing, the median was calculated with 3 seasons of data. If fewer than 3 seasons were used to derive the median, the entry is flagged (z). (4) A 25th percentile for a season is best derived with data from a minimum of 4 lakes/season. However, this table provides 25th percentiles that were derived with fewer than 4 lakes/season in order to retain all information for all seasons. In calculating the 25th percentile for a season with fewer than 4 lake medians, the statistical program automatically used the minimum value within the fewer-than-4 population. If fewer than 4 lakes were used in developing a seasonal quartile and or all-seasons median, the entry is flagged (zz).

Note: For seasonal values, refer to Appendix A, "Descriptive Statistics Data Tables for Aggregate Ecoregion."

Table 3a. Reference conditions for Ecoregion III lakes and reservoirs subecoregion 6

Parameter	No. of lakes N*	Reported values		25th percentiles based on all seasons data for the decade	Reference lakes§
		Min	Max	P25† all seasons‡	P75 all seasons
TKN (mg/L)	4	0.45	0.53	0.45	
NO_2+NO_3-N (mg/L)	1	0.06	0.06	0.06 (zz)	
TN (mg/L) - calculated				0.51	
TN (mg/L) - reported	—	—	—	—	
TP (µg/L)	7	55	309	172‖	
Secchi (meters)	2	0.9	1.9	1.9 (zz)	
Chlorophyll *a* (µg/L) - F	1	24.6	24.6	24.6 (zz)	
Chlorophyll *a* (µg/L) - S	—	—	—	—	
Chlorophyll *a* (µg/L) - T	—	—	—	—	

Table 3b. Reference conditions for Ecoregion III lakes and reservoirs subecoregion 10

Parameter	No. of lakes N*	Reported values		25th percentiles based on all seasons data for the decade	Reference lakes§
		Min	Max	P25† all seasons‡	P75 all seasons
TKN (mg/L)	13	0.32	1.25	0.60	
NO_2+NO_3-N (mg/L)	12	0.01	0.37	0.12	
TN (mg/L) - calculated				0.72	
TN (mg/L) - reported	3	0.36	0.39	0.36	
TP (µg/L)	17	30	208	35	
Secchi (meters)	7	1.3	2.4	2	
Chlorophyll *a* (µg/L) - F	4	3.4	5.6	3.4	
Chlorophyll *a* (µg/L) - S	—	—	—	—	
Chlorophyll *a* (µg/L) - T	2 (z)	33.5	71	33.5 (zz)	

Table 3c. Reference conditions for Ecoregion III lakes and reservoirs subecoregion 12

Parameter	No. of lakes N*	Reported values		25th percentiles based on all seasons data for the decade	Reference lakes§
		Min	Max	P25† all seasons‡	P75 all seasons
TKN (mg/L)	9	—	0.54	—	
NO_2+NO_3-N (mg/L)	2	1.44	2.07	1.44 (zz)	
TN (mg/L) - calculated				1.44	
TN (mg/L) - reported	—	—	—	—	
TP (µg/L)	18	17	152	20	
Secchi (meters)	15 (z)	0.5	4.6	2.2	
Chlorophyll *a* (µg/L) - F	9 (z)	1.2	40.5	2.7	
Chlorophyll *a* (µg/L) - S	—	—	—	—	
Chlorophyll *a* (µg/L) - T	6 (z)	1.1	30.1	4.7	

Table 3d. Reference conditions for Ecoregion III lakes and reservoirs subecoregion 13

Parameter	No. of lakes N*	Reported values		25th percentiles based on all seasons data for the decade	Reference lakes§
		Min	Max	P25† all seasons‡	P75 all seasons
TKN (mg/L)	42	0.07	2.69	0.34	
NO_2+NO_3-N (mg/L)	10	0.01	0.68	0.01	
TN (mg/L) - calculated				0.35	
TN (mg/L) - reported	7	0.50	2.37	0.51	
TP (µg/L)	49	11	742	30	
Secchi (meters)	36	0.1	4.9	2.3	
Chlorophyll *a* (µg/L) - F	4 (z)	1.7	5.5	1.9	
Chlorophyll *a* (µg/L) - S	32	1.8	46.2	3.5	
Chlorophyll *a* (µg/L) - T	—	—	—	—	

Table 3e. Reference conditions for Ecoregion III lakes and reservoirs subecoregion 18

Parameter	No. of lakes N*	Reported values		25th percentiles based on all seasons data for the decade	Reference lakes§
		Min	Max	P25† all seasons‡	P75 all seasons
TKN (mg/L)	5	0.33	0.38	0.33	
NO_2+NO_3-N (mg/L)	1 (z)	0.05	0.05	0.05 (zz)	
TN (mg/L) - calculated				0.38	
TN (mg/L) - reported	—	—	—	—	
TP (µg/L)	11	10	100	10	
Secchi (meters)	9	1.1	4.5	3	
Chlorophyll *a* (µg/L) - F	2 (z)	4	5.30	4 (zz)	
Chlorophyll *a* (µg/L) - S	5	0.8	7.4	1.4	
Chlorophyll *a* (µg/L) - T	—	—	—	—	

Table 3f. Reference conditions for Ecoregion III lakes and reservoirs subecoregion 20

Parameter	No. of lakes N*	Reported values		25th percentiles based on all seasons data for the decade	Reference lakes§
		Min	Max	P25† all seasons‡	P75 all seasons
TKN (mg/L)	26	0.03	2.89	0.14	
NO_2+NO_3-N (mg/L)	9	—	0.13	0.01	
TN (mg/L) - calculated				0.15	
TN (mg/L) - reported	—	—	—	—	
TP (µg/L)	38	2	170	3	
Secchi (meters)	33	1.9	4.61	3.2	
Chlorophyll *a* (µg/L) - F	2 (z)	0.00	3	0.00 (zz)	
Chlorophyll *a* (µg/L) - S	34	0.3	14.3	1.4	
Chlorophyll *a* (µg/L) - T	—	—	—	—	

Table 3g. Reference conditions for Ecoregion III lakes and reservoirs subecoregion 22

Parameter	No. of lakes N*	Reported values		25th percentiles based on all seasons data for the decade	Reference lakes§
		Min	Max	P25† all seasons‡	P75 all seasons
TKN (mg/L)	12	0.10	1.35	0.21	
NO_2+NO_3-N (mg/L)	11	0.02	0.24	0.02	
TN (mg/L) - calculated				0.23	
TN (mg/L) - reported	9	0.23	1.51	0.31	
TP (μg/L)	15	2	135	15	
Secchi (meters)	8	0.7	4	2.9	
Chlorophyll *a* (μg/L) - F	1 (z)	2.5	2.5	2.50 (zz)	
Chlorophyll *a* (μg/L) - S	5	1.1	4.4	2	
Chlorophyll *a* (μg/L) - T	5	1.2	4.4	1.9	

Table 3h. Reference conditions for Ecoregion III lakes and reservoirs subecoregion 24

Parameter	No. of lakes N*	Reported values		25th percentiles based on all seasons data for the decade	Reference lakes§
		Min	Max	P25† all seasons‡	P75 all seasons
TKN (mg/L)	12	0.27	1.30	0.36	
NO_2+NO_3-N (mg/L)	16	0.01	2.25	0.01	
TN (mg/L) - calculated				0.37	
TN (mg/L) - reported	11	0.45	1.30	0.57	
TP (μg/L)	16	13	67	22	
Secchi (meters)	10	0.4	2.9	1.5	
Chlorophyll *a* (μg/L) - F	—	—	—	—	
Chlorophyll *a* (μg/L) - S	9	0.6	30.3	3.3	
Chlorophyll *a* (μg/L) - T	7	0.9	17.2	1.7	

Table 3i. Reference conditions for Ecoregion III lakes and reservoirs subecoregion 80

Parameter	No. of lakes N*	Reported values		25th percentiles based on all seasons data for the decade	Reference lakes§
		Min	Max	P25† all seasons‡	P75 all seasons
TKN (mg/L)	4	0.16	0.16	0.16	
NO_2+NO_3-N (mg/L)	3	0.01	0.01	0.01 (zz)	
TN (mg/L) - calculated				0.17	
TN (mg/L) - reported	—	—	—	—	
TP (μg/L)	7	86	90	86	
Secchi (meters)	6 (z)	1.7	3.7	2.80	
Chlorophyll *a* (μg/L) - F	5 (z)	4.4	5.2	4.4	
Chlorophyll *a* (μg/L) - S	—	—	—	—	
Chlorophyll *a* (μg/L) - T	3	3.1	61.5	3.1 (zz)	

Table 3j. Reference conditions for Ecoregion III lakes and reservoirs subecoregion 81

Parameter	No. of lakes N*	Reported values		25th percentiles based on all seasons data for the decade	Reference lakes§
		Min	Max	P25† all seasons‡	P75 all seasons
TKN (mg/L)	1 (z)	0.50	0.50	0.50 (zz)	
NO_2+NO_3-N (mg/L)	1 (z)	0.02	0.02	0.02 (zz)	
TN (mg/L) - calculated				0.52	
TN (mg/L) - reported	—	—	—	—	
TP (µg/L)	1 (z)	20	20	20 (zz)	
Secchi (meters)	1 (z)	1.7	1.7	1.7 (zz)	
Chlorophyll *a* (µg/L) - F	—	—	—	—	
Chlorophyll *a* (µg/L) - S	—	—	—	—	
Chlorophyll *a* (µg/L) - T	—	—	—	—	

* N = largest value reported for a decadal season. TN calculated is based on the sum of TKN+NO_2+NO_3. TN reported is actual TN value reported in the database for one sample.
† 75th percentile for Secchi.
‡ Median for all seasons' 25th percentiles, e.g., this value was calculated from four seasons' 25th percentiles. If the seasonal 25th percentile (P25) TP values are: spring 10 µg/L, summer 15 µg/L, fall 12 µg/L, and winter 5 µg/L, the median value of all seasons' P25 will be 11µg/L.
§ As determined by the Regional Technical Assistance Groups (RTAGs).
‖ This value appears inordinately high and may either be a statistical anomaly or reflect a unique condition. In any case, further regional investigation is indicated to determine the sources, i.e., measurement error, notational error, statistical anomaly, naturally enriched conditions, or cultural impacts.

Abbreviations: P25, 25th percentile of all data; P75, 75th percentile of all data; F, Chlorophyll *a* measured by Fluorometric method with acid correction; S, Chlorophyll *a* measured by Spectrophotometric method with acid correction; T, Chlorophyll *a b c* measured by Trichromatic method; —, not applicable.

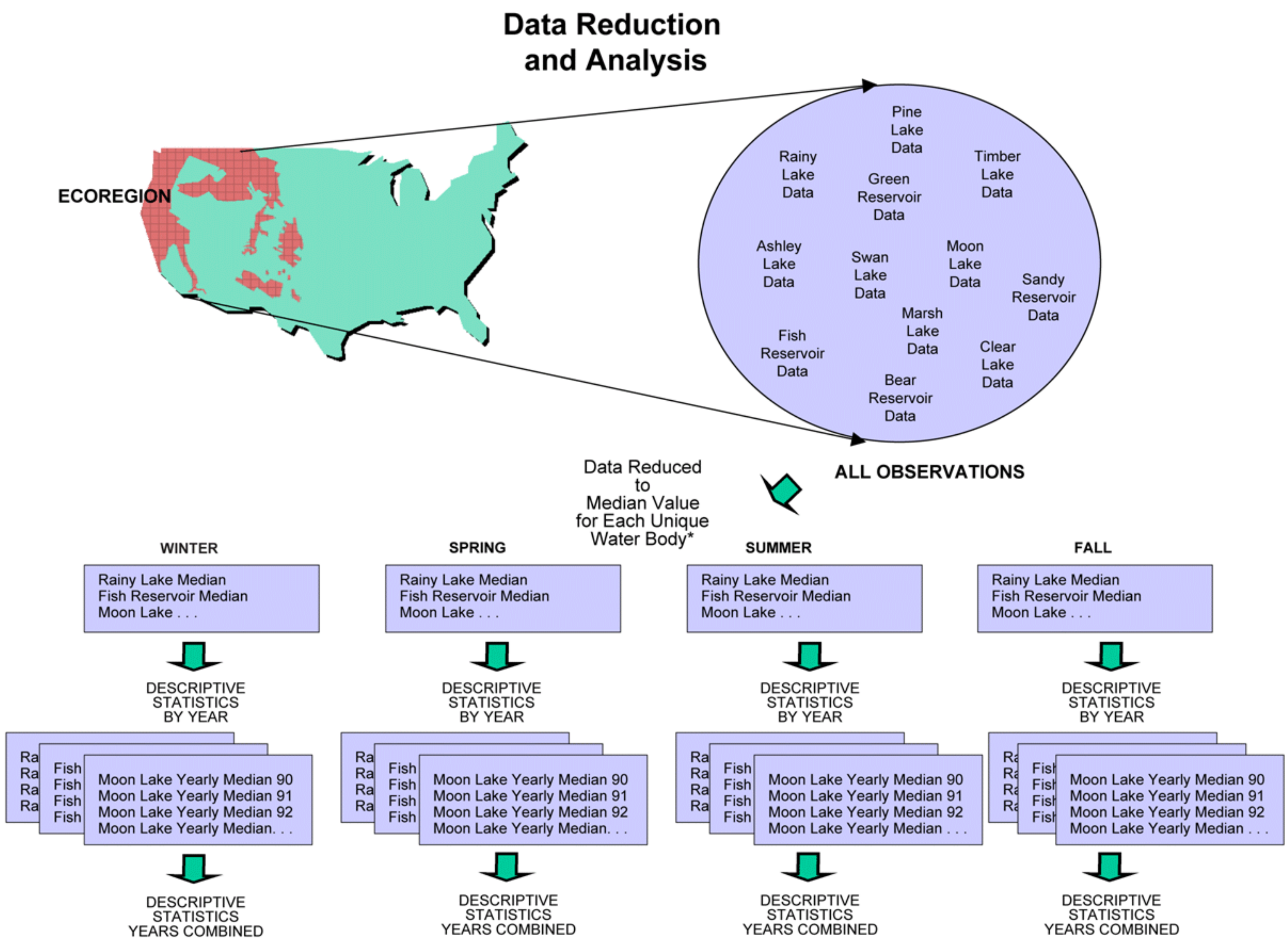
Definitions: (1) Number of Lakes refers to the number of lakes and reservoirs for which data existed for the summer months since summer is generally when the greatest amount of nutrient sampling is conducted. If another season greatly predominates, notification is made (s=spring, f=fall, w=winter). (2) Medians. All values (min, max, and 25^{th} percentiles) included in the table are based on waterbody medians. All data for a particular parameter within a lake for the decade were reduced to one median for that lake. This prevents over-representation of individual waterbodies with a great deal of data versus those with fewer data points within the statistical analysis. (3) 25th percentile for all seasons is calculated by taking the median of the 4 seasonal 25th percentiles. If a season is missing, the median was calculated with 3 seasons of data. If fewer than 3 seasons were used to derive the median, the entry is flagged (z). (4) A 25th percentile for a season is best derived with data from a minimum of 4 lakes/season. However, this table provides 25th percentiles that were derived with fewer than 4 lakes/season in order to retain all information for all seasons. In calculating the 25th percentile for a season with fewer than 4 lake medians, the statistical program automatically used the minimum value within the fewer-than-4 population. If fewer than 4 lakes were used in developing a seasonal quartile and or all-seasons median, the entry is flagged (zz).

Note: For seasonal and yearly values, refer to Appendix B, "Descriptive Statistics Data Tables for Level III Subecoregions Within Aggregate Ecoregion."

Table 4. Changes in temperate lake attributes according to trophic state (adapted from Carlson and Simpson, 1995)

TSI Value	SD (m)	TP (µg/L)	Attributes	Water Supply	Recreation	Fisheries
<30	>8	<6	Oligotrophy: Clear water, oxygen throughout the year in the hypolimnion			Salmonid fisheries dominate
30-40	8-4	6-12	Hypolimnia of shallower lakes may become anoxic			Salmonid fisheries in deep lakes
40-50	4-2	12-24	Mesotrophy: Water moderately clear but increasing probability of hypolimnetic anoxia during summer	Iron and manganese evident during the summer. THM precursors exceed 0.1 mg/L and turbidity >1 NTU		Hypolimnetic anoxia results in loss of salmonids. Walleye may predominate
50-60	2-1	24-48	Eutrophy: Anoxic hypolimnia, macrophyte problems possible	Iron, manganese, taste, and odor problems worsen		Warm-water fisheries only. Bass may be dominant
60-70	0.5-1	48-96	Blue-green algae dominate, algal scums and macrophyte problems		Weeds, algal scums, and low transparency discourage swimming and boating	
70-80	0.25-0.5	96-192	Hypereutrophy (light limited). Dense algae and macrophytes			
>80	<0.25	192-384	Algal scums, few macrophytes			Rough fish dominate, summer fish kills possible

Note: This table is provided to allow the reader to make comparisons between the ecoregional criteria provided in this document and traditional nutrient and biological endpoints.



**Unique Water Body - is a water body that is unique to a state, a subecoregion, a county, the year, and the season.*

Figure 5a. Illustration of data reduction process for lake data.

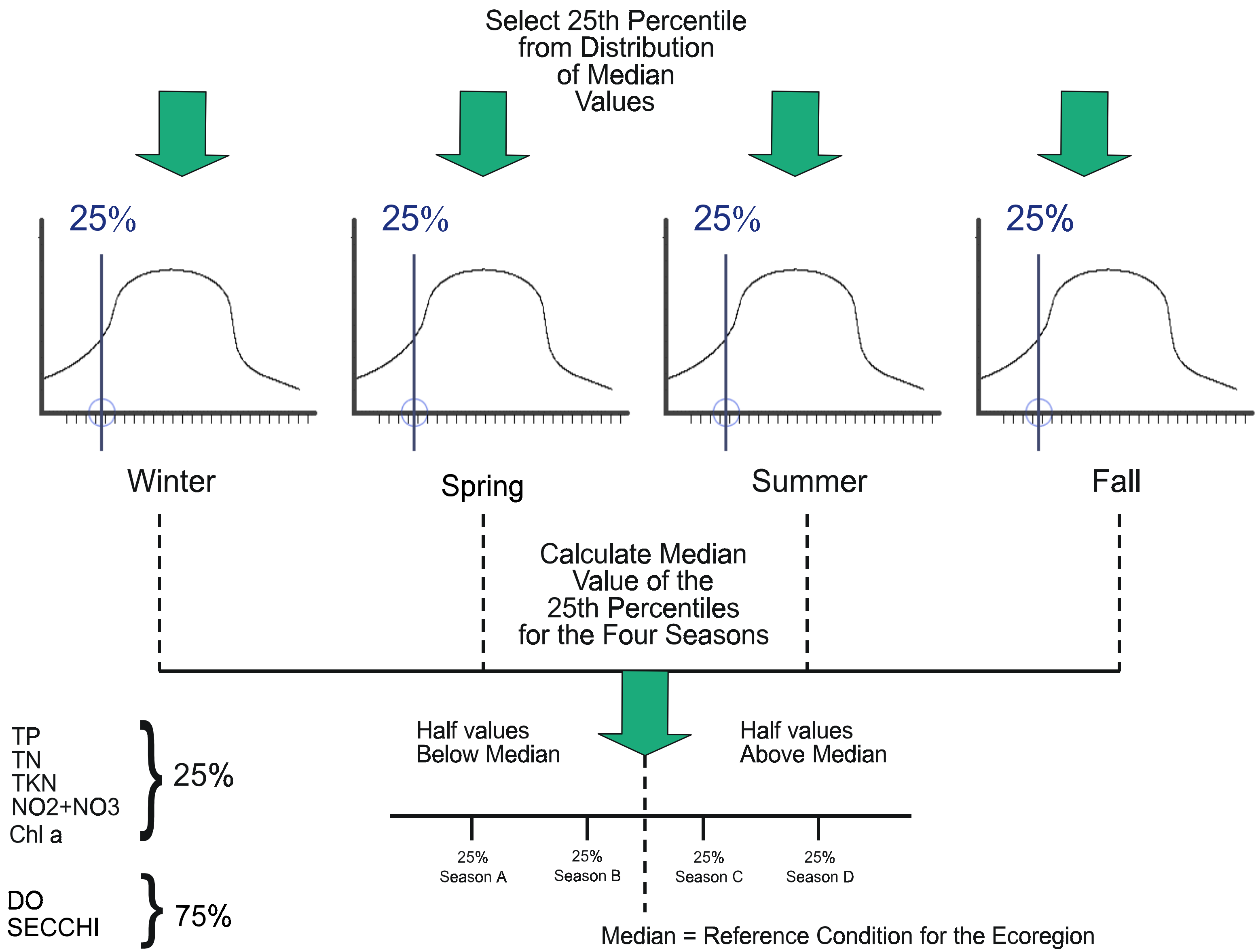


Figure 5b. Illustration of reference condition calculation.

3. **TN reported:** This is the median based on reported values for TN from the database.

4. **Chlorophyll *a*:** Medians based on all methods are reported; however, the acid-corrected medians are preferred to the uncorrected medians. In developing a reference condition from a particular method, it is recommended that the method with the most observations be used. Fluorometric and spectrophotometric observations are preferred over all other methods. However, when no data exist for fluorometric and spectrophotometric methods, trichromatic values may be used. Data from the various techniques are not interchangeable.

5. **Periphyton:** Where periphyton data exist, record them separately. For periphyton-dominated streams, a measure of periphyton chlorophyll is a more appropriate response variable than planktonic chlorophyll *a*. See Table 4, page 101, of the *Rivers and Streams Nutrient Technical Guidance Manual* (U.S. EPA, 2000b) for values of periphyton and planktonic chlorophyll *a* related to eutrophy in streams.

6. **Secchi depth:** The 75th percentile is reported for Secchi depth because this is the only variable for which the value of the parameter **increases** with greater clarity (for lakes and reservoirs only).

7. **Turbidity units:** Turbidity units from all methods are reported. FTUs and NTUs are preferred over JCUs. If FTUs and NTUs do not exist, use JCUs. These units are not interchangeable. Turbidity is chosen as a response variable in streams because it can be an indicator of increasing algal biomass due to nutrient enrichment. See pages 32-33 of the *Rivers and Streams Nutrient Technical Guidance Manual* for a discussion of turbidity and correlations with algal growth.

8. **Lack of data:** A dash (—) represents missing, inadequate, or inconclusive data. According to EPA statistical analyses, 5% or fewer of the reported observations are "below detection." Because of this low incidence, these data were retained and factored into the statistical analysis as reported according to the protocols described in Appendix C, "Quality Control/Quality Assurance Rules."

5.0 REFERENCE SITES AND CONDITIONS IN AGGREGATE ECOREGION III

Reference conditions represent the natural, least impacted conditions, or what is considered to be the most attainable conditions. This chapter compares the different reference conditions determined from the two methods and establishes which reference condition is most appropriate.

- *A priori* determination of reference sites. The preferred method for establishing reference condition is to choose the upper percentile of an a priori population of reference streams. States and Tribes are encouraged to identify reference conditions based on this method.

- Statistical determination of reference conditions (25th percentile of entire database). See Tables 2 and 3a-l in Section 4.0.

- RTAG discussion and rationale for selection of reference sites and conditions in Ecoregion

III. The RTAG should compare the results derived from the two methods described above and present a rationale for the final selection of reference sites.

6.0 MODELS USED TO PREDICT OR VERIFY RESPONSE PARAMETERS

The RTAG is encouraged to identify and apply relevant models to support nutrient criteria development. There are three scenarios under which models may be used to derive criteria or support criteria development:

- Models for predicting correlations between causal and response variables
- Models used to verify reference conditions based on percentiles
- Regression models used to predict reference conditions in impacted areas

Appendix C of the Rivers and Streams Technical Guidance Manual (U.S. EPA, 2000b), and Chapter 9 of the Lakes and Reservoirs Technical Guidance Manual (U.S. EPA, 2000a) should be consulted for further details.

7.0 FRAMEWORK FOR REFINING RECOMMENDED NUTRIENT CRITERIA FOR LAKES AND RESERVOIRS IN AGGREGATE ECOREGION III

Information on each of the following six weight-of-evidence factors is important to refine the criteria presented in this document. All elements should be addressed in developing criteria, as is expressed in EPA's nutrient criteria technical guidance manuals. It is our expectation that EPA Regions, States, and Tribes (as RTAGs) will consider these elements as States/Tribes develop their criteria. This section should be viewed as a worksheet (sections are left blank for this purpose) to assist in the refinement of nutrient criteria. If many of these elements are ultimately unaddressed, EPA may rely on the proposed reference conditions presented in Tables 3a-l and other literature and information readily available to the EPA Headquarters nutrient team to develop nutrient water quality recommendations for this Ecoregion.

7.1 Example Worksheet for Developing Aggregate Ecoregion and Subecoregion Nutrient Criteria

*Literature sources:*____

*Historical data and trends:*____________________________________

*Reference condition:*____

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*Models:*____

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*RTAG expert review and consensus:*_______________________________

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*Downstream effects:*____

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7.2 Setting Seasonal Criteria

The recommendations presented in this document are based in part on medians of all the 25th percentile seasonal data (decadal), and as such reflect all seasons and not one particular season or year. It is recommended that States and Tribes monitor in all seasons to best assess compliance with the resulting criterion. States/Tribes may choose to develop criteria that reflect **each** particular season or **given season** or a **given year** when there is significant variability between seasons/years or designated uses that are specifically tied to one or more seasons of the year (e.g., recreation, fishing). Using the tables in Appendix A and B, one can set reference conditions based on a particular season or year and then develop a criterion based on each individual season. Obviously, this option is season-specific and would require increased monitoring within each season to assess compliance. If a case can be made that one season is more appropriate than another season or more appropriate than the annual median, criteria should be season specific. For example, in most parts of the country, spring and summer are the most common growth periods, so criteria for chlorophyll *a* and Secchi may be set for spring and summer only. However, caution should be used when developing criteria for TN and TP because the peak loading of these nutrients may take place in seasons other than summer, such as winter and spring. For these reasons, EPA developed annual criteria and provided additional seasonal information in appendices.

7.3 When Data/Reference Conditions Are Lacking

When data are unavailable to develop a reference condition for a particular parameter(s) within a subecoregion, EPA recommends one of three options: (1) use data from a similar neighboring subecoregion (e.g., if data are few or nonexistent for the Northern Cascades, consider using the data and reference conditions developed for the Cascades);(2) use the 25th percentiles for the Aggregate Ecoregion; or (3) consider using the lowest of the yearly medians for that parameter calculated for all the subecoregions within the Aggregate Ecoregion.

7.4 Site-Specific Criteria Development

Criteria may be refined in a number of ways. The best way is to follow the critical elements of criteria development as well as to refer to the *Lakes and Reservoirs Nutrient Criteria Technical Guidance Manual* (U.S. EPA, 2000a). The Technical Guidance Manual presents sections on each of the following factors to consider in setting criteria:

- Refinements to Ecoregions (Chapter 3). See paper by Dale Robertson (USGS, 2001b), an alternative approach to ecoregions entitled "An Alternative Regarding the Scheme for Defining Nutrient Criteria for Rivers and Streams."
- Classification of waterbodies (Chapter 3)
- Setting seasonal criteria to reflect major seasonal climate differences and accounting for significant or cyclical precipitation events (high-flow/low-flow conditions) (Chapter 7)
- Setting criteria for reservoirs only. (The technical guidance manual recommends that data be separated for lakes and reservoirs and treated independently if possible because of differing physical conditions that occur in lakes and reservoirs. In this document all data from both reservoirs and lakes were considered together since STORET does not allow for the differentiation of data except by waterbody name.)

8.0 LITERATURE CITED

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USGS. 2001b. An Alternative Regarding the Scheme for Defining Nutrient Criteria for Rivers and Streams. Dale M. Robertson, David A. Saad, and Ann Wieben. Water Resources Investigations Report 01-4073.

9.0 APPENDICES

A. Descriptive Statistics Data Tables for Aggregate Ecoregion
B. Descriptive Statistics Data Tables for Level III Subecoregions Within Aggregate Ecoregion
C. Quality Control/Quality Assurance Rules

APPENDIX A

Descriptive Statistics Data Tables for Aggregate Ecoregion

Aggregate Nutrient Ecoregion: III
Lakes and Reservoirs
Descriptive Statistics by Decade and Season
from 1990 to 1999
Chloro_A_Fluor_cor_ug_L

season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
FALL	5	10.17	5.2500	24.65	8.17	3.65	80	5.25	5.85	7.15	7.93	24.65
SPRING	4	5.89	4.4000	8.18	1.61	0.81	27	4.40	4.86	5.49	6.91	8.18
SUMMER	28	8.66	.00000	40.50	11.71	2.21	135	0.70	2.08	3.60	7.65	35.55
WINTER	4	2.94	1.4500	4.50	1.27	0.63	43	1.45	2.03	2.90	3.85	4.50

Data were not always available for all years.

Aggregate Nutrient Ecoregion: III
Lakes and Reservoirs
Descriptive Statistics by Decade and Season
from 1990 to 1997
Chloro_A_Phyto_Spec_A_ug_L

season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
FALL	48	7.79	.25000	83.40	12.54	1.81	161	0.72	2.05	3.98	9.38	21.30
SPRING	57	5.73	.30000	38.69	7.69	1.02	134	0.44	1.90	2.80	5.75	23.70
SUMMER	83	9.28	.00000	155.80	19.73	2.17	213	0.85	1.80	3.10	7.40	38.85
WINTER	7	17.61	1.2000	29.90	11.79	4.46	67	1.20	5.60	17.00	29.90	29.90

Data were not always available for all years.

Aggregate Nutrient Ecoregion: III
Lakes and Reservoirs
Descriptive Statistics by Decade and Season
from 1990 to 1997
Chloro_A_Trich_unco_ug_L

season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
FALL	7	4.95	.40000	11.15	4.24	1.60	86	0.40	0.74	4.25	10.23	11.15
SPRING	11	8.62	.95000	42.08	13.76	4.15	160	0.95	1.42	2.76	4.69	42.08
SUMMER	20	16.29	.95000	71.00	19.46	4.35	119	1.01	3.02	9.79	17.61	66.25

Data were not always available for all years.

Aggregate Nutrient Ecoregion: III
Lakes and Reservoirs
Descriptive Statistics by Decade and Season
from 1991 to 1999
DIP_ug_L

season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
FALL	10	45.70	2.0000	138.00	49.03	15.50	107	2.00	4.50	27.50	83.50	138.00
SPRING	10	31.83	5.5000	110.00	31.10	9.84	98	5.50	7.50	23.00	43.00	110.00
SUMMER	10	44.85	.00000	140.00	62.75	19.84	140	0.00	4.00	5.50	127.00	140.00
WINTER	10	47.78	13.250	122.50	38.98	12.33	82	13.25	17.50	33.00	64.00	122.50

Data were not always available for all years.

Aggregate Nutrient Ecoregion: III
Lakes and Reservoirs
Descriptive Statistics by Decade and Season
from 1990 to 1999
Dissolved_Oxygen_mg_L

season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
FALL	66	7.60	.50000	14.70	2.20	0.27	29	4.35	6.70	7.69	8.70	10.90
SPRING	72	8.40	2.2000	13.00	1.89	0.22	23	4.90	7.43	8.08	9.63	11.48
SUMMER	115	7.09	1.0500	13.40	1.78	0.17	25	4.20	6.15	7.00	8.20	9.75
WINTER	24	9.89	2.3500	13.85	2.68	0.55	27	4.50	8.78	10.30	11.69	13.06

Data were not always available for all years.

Aggregate Nutrient Ecoregion: III
Lakes and Reservoirs
Descriptive Statistics by Decade and Season
from 1990 to 1999
Nitrite_Nitrate_NO2_NO3_mg_L

season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
FALL	36	0.19	.00250	2.11	0.44	0.07	235	0.00	0.02	0.06	0.13	1.73
SPRING	41	0.49	.00150	3.68	0.88	0.14	181	0.01	0.01	0.07	0.56	2.64
SUMMER	54	0.19	.00000	3.20	0.54	0.07	279	0.00	0.01	0.03	0.11	1.40
WINTER	22	0.44	.01000	1.94	0.60	0.13	135	0.01	0.04	0.20	0.43	1.79

Data were not always available for all years.

Aggregate Nutrient Ecoregion: III
Lakes and Reservoirs
Descriptive Statistics by Decade and Season
from 1990 to 1999
Nitrogen_Tot_Kjeldhal_mg_L

season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
FALL	63	0.62	.00000	2.96	0.50	0.06	81	0.11	0.29	0.50	0.90	1.34
SPRING	93	0.60	.00000	3.51	0.69	0.07	115	0.03	0.20	0.41	0.69	2.54
SUMMER	122	0.61	.00000	3.19	0.52	0.05	85	0.10	0.30	0.47	0.75	1.42
WINTER	31	0.69	.00000	2.48	0.62	0.11	90	0.05	0.34	0.51	0.90	2.30

Data were not always available for all years.

Aggregate Nutrient Ecoregion: III
Lakes and Reservoirs
Descriptive Statistics by Decade and Season
from 1990 to 1998
SECCHI_m

season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
FALL	61	2.14	.17500	7.00	1.48	0.19	69	0.21	1.00	2.08	2.90	4.90
SPRING	65	1.74	.10000	4.30	1.25	0.15	72	0.15	0.70	1.60	2.84	4.00
SUMMER	121	2.03	.02500	7.80	1.42	0.13	70	0.23	1.00	1.80	2.70	4.55
WINTER	12	1.79	.50000	3.59	1.02	0.29	57	0.50	0.91	1.85	2.46	3.59

Data were not always available for all years.

Aggregate Nutrient Ecoregion: III
Lakes and Reservoirs
Descriptive Statistics by Decade and Season
from 1990 to 1998
Total_Nitrogen_mg_L

season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
FALL	19	0.62	.18000	2.28	0.50	0.12	81	0.18	0.29	0.46	0.82	2.28
SPRING	26	1.12	.16500	4.33	1.06	0.21	95	0.23	0.50	0.56	1.63	3.64
SUMMER	24	0.85	.15500	2.42	0.64	0.13	76	0.22	0.36	0.69	1.00	2.41
WINTER	8	0.72	.36000	2.32	0.65	0.23	90	0.36	0.44	0.47	0.64	2.32

Data were not always available for all years.

Aggregate Nutrient Ecoregion: III
Lakes and Reservoirs
Descriptive Statistics by Decade and Season
from 1990 to 1999
Total_Phosphorus_ug_L

season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
FALL	91	93.61	.00000	755.00	138.26	14.49	148	2.50	15.00	35.50	120.00	420.00
SPRING	104	98.67	1.5000	1630.00	214.12	21.00	217	2.50	20.00	40.00	82.00	270.00
SUMMER	170	77.23	.00000	1200.00	138.39	10.61	179	2.50	11.25	30.00	75.00	260.00
WINTER	41	107.48	2.5000	800.00	151.81	23.71	141	6.25	30.00	60.00	115.00	260.00

Data were not always available for all years.

Aggregate Nutrient Ecoregion: III
Lakes and Reservoirs
Descriptive Statistics by Decade and Season
from 1991 to 1999
pH_S_U

season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
FALL	10	8.37	8.0000	9.05	0.32	0.10	4	8.00	8.17	8.30	8.40	9.05
SPRING	10	8.31	7.9400	8.70	0.23	0.07	3	7.94	8.13	8.26	8.50	8.70
SUMMER	33	8.19	6.3000	9.48	0.59	0.10	7	7.28	8.00	8.18	8.43	9.30
WINTER	10	8.18	8.0250	8.60	0.17	0.05	2	8.03	8.07	8.10	8.25	8.60

Data were not always available for all years.

APPENDIX B

Descriptive Statistics Data Tables for Level III Subecoregions Within Aggregate Ecoregion

Aggregate Nutrient Ecoregion: III
Lakes and Reservoirs
Descriptive Statistics by Subecoregion, Decade and Season
from 1990 to 1999
Chloro_A_Fluor_cor_ug_L

subecoregion	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
6	FALL	1	24.65	24.650	24.65	.	.	.	24.7	24.7	24.7	24.7	24.7
6	SUMMER	1	32.00	32.000	32.00	.	.	.	32.0	32.0	32.0	32.0	32.0
6	WINTER	1	4.50	4.5000	4.50	.	.	.	4.50	4.50	4.50	4.50	4.50
10	FALL	3	6.98	5.8500	7.93	1.05	0.61	15	5.85	5.85	7.15	7.93	7.93
10	SPRING	3	6.38	5.3250	8.18	1.56	0.90	24	5.33	5.33	5.65	8.18	8.18
10	SUMMER	4	1.93	.90000	2.58	0.72	0.36	37	0.90	1.48	2.13	2.39	2.58
10	WINTER	3	2.42	1.4500	3.20	0.89	0.51	37	1.45	1.45	2.60	3.20	3.20
12	SUMMER	9	17.31	1.2000	40.50	15.3	5.09	88	1.20	2.70	12.8	31.3	40.5
13	SUMMER	4	3.18	1.7000	5.50	1.71	0.86	54	1.70	1.90	2.75	4.45	5.50
18	SUMMER	2	4.65	4.0000	5.30	0.92	0.65	20	4.00	4.00	4.65	5.30	5.30
20	SUMMER	2	1.50	.00000	3.00	2.12	1.50	141	0.00	0.00	1.50	3.00	3.00
22	SUMMER	1	2.50	2.5000	2.50	.	.	.	2.50	2.50	2.50	2.50	2.50
80	FALL	1	5.25	5.2500	5.25	.	.	.	5.25	5.25	5.25	5.25	5.25
80	SPRING	1	4.40	4.4000	4.40	.	.	.	4.40	4.40	4.40	4.40	4.40
80	SUMMER	5	3.88	.70000	5.30	1.88	0.84	48	0.70	3.80	4.40	5.20	5.30

Data were not always available for all years.

Aggregate Nutrient Ecoregion: III
Lakes and Reservoirs
Descriptive Statistics by Subecoregion, Decade and Season
from 1990 to 1997
Chloro_A_Phyto_Spec_A_ug_L

subecoregion	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
13	FALL	18	12.74	2.4000	83.40	18.4	4.34	144	2.40	4.55	7.73	13.1	83.4
13	SPRING	23	7.43	.80000	23.70	7.50	1.56	101	1.00	2.40	3.50	11.0	22.3
13	SUMMER	32	11.85	1.2500	62.50	15.1	2.67	127	1.65	2.39	5.15	13.9	45.5
13	WINTER	5	21.02	5.6000	29.90	11.3	5.03	54	5.60	12.5	27.2	29.9	29.9
18	FALL	2	6.13	2.4000	9.85	5.27	3.73	86	2.40	2.40	6.13	9.85	9.85
18	SPRING	3	1.60	.30000	2.40	1.14	0.66	71	0.30	0.30	2.10	2.40	2.40
18	SUMMER	5	3.38	.85000	7.40	2.64	1.18	78	0.85	1.40	2.80	4.45	7.40
20	FALL	20	3.96	.40000	21.30	5.03	1.12	127	0.65	1.40	2.05	4.38	17.2
20	SPRING	18	2.70	.30000	7.30	1.60	0.38	60	0.30	1.80	2.30	3.13	7.30
20	SUMMER	34	4.11	.00000	42.20	7.11	1.22	173	0.75	1.50	2.35	4.30	10.5
20	WINTER	1	1.20	1.2000	1.20	.	.	.	1.20	1.20	1.20	1.20	1.20
22	FALL	4	2.64	.72000	4.36	1.53	0.76	58	0.72	1.53	2.74	3.76	4.36
22	SPRING	4	2.41	1.2150	3.00	0.81	0.41	34	1.22	1.96	2.72	2.87	3.00
22	SUMMER	5	5.56	1.1450	11.45	3.99	1.78	72	1.15	2.83	5.42	6.96	11.5
24	FALL	4	10.62	.25000	22.00	8.92	4.46	84	0.25	4.80	10.1	16.4	22.0
24	SPRING	9	10.31	.43750	38.69	13.7	4.58	133	0.44	1.21	3.78	14.4	38.7
24	SUMMER	7	29.52	.79000	155.80	56.1	21.2	190	0.79	1.75	15.3	15.4	156
24	WINTER	1	17.00	17.000	17.00	.	.	.	17.0	17.0	17.0	17.0	17.0

Data were not always available for all years.

Aggregate Nutrient Ecoregion: III
Lakes and Reservoirs
Descriptive Statistics by Subecoregion, Decade and Season
from 1990 to 1997
Chloro_A_Trich_unco_ug_L

subecoregion	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
10	SUMMER	2	52.25	33.500	71.00	26.5	18.8	51	33.5	33.5	52.3	71.0	71.0
12	SUMMER	6	12.51	1.0600	30.10	10.1	4.14	81	1.06	4.70	12.0	15.3	30.1
22	FALL	5	2.65	.40000	4.44	1.94	0.87	73	0.40	0.74	3.43	4.25	4.44
22	SPRING	4	2.40	1.2350	2.97	0.79	0.39	33	1.24	1.94	2.69	2.86	2.97
22	SUMMER	5	5.22	1.3500	9.18	3.15	1.41	60	1.35	2.94	5.48	7.17	9.18
24	FALL	2	10.69	10.230	11.15	0.65	0.46	6	10.2	10.2	10.7	11.2	11.2
24	SPRING	7	12.18	.95000	42.08	16.6	6.26	136	0.95	1.42	3.92	29.4	42.1
24	SUMMER	4	9.39	.95000	17.22	8.94	4.47	95	0.95	1.66	9.70	17.1	17.2
80	SUMMER	3	27.53	3.1000	61.50	30.3	17.5	110	3.10	3.10	18.0	61.5	61.5

Data were not always available for all years.

Aggregate Nutrient Ecoregion: III
Lakes and Reservoirs
Descriptive Statistics by Subecoregion, Decade and Season
from 1991 to 1999
DIP_ug_L

subecoregion	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
10	FALL	8	40.88	2.0000	138.00	48.8	17.2	119	2.00	3.75	22.3	67.5	138
10	SPRING	8	23.53	5.5000	47.00	16.5	5.83	70	5.50	7.13	22.8	38.0	47.0
10	SUMMER	8	36.06	.00000	139.00	59.9	21.2	166	0.00	3.75	4.75	66.3	139
10	WINTER	8	42.22	13.250	101.75	31.5	11.1	75	13.3	16.4	33.0	62.0	102
12	FALL	2	65.00	20.000	110.00	63.6	45.0	98	20.0	20.0	65.0	110	110
12	SPRING	2	65.00	20.000	110.00	63.6	45.0	98	20.0	20.0	65.0	110	110
12	SUMMER	2	80.00	20.000	140.00	84.9	60.0	106	20.0	20.0	80.0	140	140
12	WINTER	2	70.00	17.500	122.50	74.2	52.5	106	17.5	17.5	70.0	123	123

Data were not always available for all years.

Aggregate Nutrient Ecoregion: III
Lakes and Reservoirs
Descriptive Statistics by Subecoregion, Decade and Season
from 1990 to 1999
Dissolved_Oxygen_mg_L

subecoregion	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
6	FALL	1	5.23	5.2250	5.23	.	.	.	5.23	5.23	5.23	5.23	5.23
6	SPRING	3	9.17	7.3000	10.20	1.62	0.94	18	7.30	7.30	10.0	10.2	10.2
6	SUMMER	1	4.73	4.7250	4.73	.	.	.	4.73	4.73	4.73	4.73	4.73
10	FALL	11	8.93	5.7500	10.90	1.42	0.43	16	5.75	8.53	9.05	9.90	10.9
10	SPRING	11	10.54	8.9000	11.73	1.00	0.30	9	8.90	9.90	10.6	11.4	11.7
10	SUMMER	14	8.15	3.4000	10.30	1.83	0.49	23	3.40	7.70	8.75	9.45	10.3
10	WINTER	10	11.86	10.000	13.85	1.07	0.34	9	10.0	11.4	11.7	12.5	13.9
12	FALL	2	7.65	6.7000	8.60	1.34	0.95	18	6.70	6.70	7.65	8.60	8.60
12	SPRING	2	8.20	7.8000	8.60	0.57	0.40	7	7.80	7.80	8.20	8.60	8.60
12	SUMMER	9	6.96	4.7000	8.40	1.27	0.42	18	4.70	6.73	7.00	8.10	8.40
12	WINTER	2	8.78	8.3500	9.20	0.60	0.42	7	8.35	8.35	8.78	9.20	9.20
13	FALL	19	7.53	5.5000	10.98	1.48	0.34	20	5.50	6.43	7.75	8.38	11.0
13	SPRING	29	8.19	4.9000	13.00	1.81	0.34	22	5.80	7.00	7.90	9.00	12.5
13	SUMMER	34	6.96	2.1000	9.13	1.35	0.23	19	4.20	6.35	6.95	7.83	8.78
13	WINTER	6	7.43	2.3500	10.75	3.35	1.37	45	2.35	4.50	8.55	9.90	10.8
18	FALL	4	5.01	1.6500	7.20	2.52	1.26	50	1.65	3.08	5.59	6.94	7.20
18	SPRING	1	8.35	8.3500	8.35	.	.	.	8.35	8.35	8.35	8.35	8.35
18	SUMMER	9	7.59	5.3500	10.90	1.97	0.66	26	5.35	6.28	6.60	9.30	10.9
20	FALL	23	7.19	.50000	11.30	2.28	0.48	32	4.15	6.70	7.30	8.38	10.4
20	SPRING	22	7.53	2.2000	10.10	1.81	0.39	24	4.25	7.30	7.75	8.78	9.20
20	SUMMER	35	6.81	3.6000	11.05	1.53	0.26	23	4.55	6.00	6.73	7.45	10.1
20	WINTER	3	8.36	6.4750	10.60	2.09	1.20	25	6.48	6.48	8.00	10.6	10.6
22	FALL	2	7.80	7.2000	8.40	0.85	0.60	11	7.20	7.20	7.80	8.40	8.40
22	SPRING	1	6.30	6.3000	6.30	.	.	.	6.30	6.30	6.30	6.30	6.30
22	SUMMER	4	5.57	1.0500	9.34	3.91	1.96	70	1.05	2.33	5.95	8.82	9.34
24	FALL	2	11.35	8.0000	14.70	4.74	3.35	42	8.00	8.00	11.4	14.7	14.7
24	SPRING	2	8.43	7.5000	9.35	1.31	0.93	16	7.50	7.50	8.43	9.35	9.35
24	SUMMER	4	8.25	4.8000	13.40	3.66	1.83	44	4.80	5.90	7.40	10.6	13.4
24	WINTER	2	9.70	9.6000	9.80	0.14	0.10	1	9.60	9.60	9.70	9.80	9.80
80	FALL	1	10.43	10.425	10.43	.	.	.	10.4	10.4	10.4	10.4	10.4
80	SPRING	1	9.95	9.9500	9.95	.	.	.	9.95	9.95	9.95	9.95	9.95
80	SUMMER	5	7.12	5.7500	9.08	1.37	0.61	19	5.75	5.95	7.00	7.80	9.08
80	WINTER	1	12.00	12.000	12.00	.	.	.	12.0	12.0	12.0	12.0	12.0
81	FALL	1	5.70	5.7000	5.70	.	.	.	5.70	5.70	5.70	5.70	5.70

Data were not always available for all years.

Aggregate Nutrient Ecoregion: III
Lakes and Reservoirs
Descriptive Statistics by Subecoregion, Decade and Season
from 1990 to 1999
Nitrite_Nitrate_NO2_NO3_mg_L

subecoregion	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
6	FALL	1	0.06	.05500	0.06	.	.	.	0.06	0.06	0.06	0.06	0.06
6	SPRING	1	0.18	.17750	0.18	.	.	.	0.18	0.18	0.18	0.18	0.18
6	SUMMER	1	0.02	.01750	0.02	.	.	.	0.02	0.02	0.02	0.02	0.02
10	FALL	9	0.13	.01750	0.25	0.08	0.03	58	0.02	0.08	0.13	0.18	0.25
10	SPRING	10	0.26	.00150	0.67	0.22	0.07	83	0.00	0.16	0.21	0.29	0.67
10	SUMMER	12	0.10	.00150	0.31	0.10	0.03	99	0.00	0.01	0.07	0.17	0.31
10	WINTER	8	0.32	.19000	0.44	0.09	0.03	29	0.19	0.24	0.33	0.39	0.44
12	FALL	2	1.92	1.7250	2.11	0.27	0.19	14	1.73	1.73	1.92	2.11	2.11
12	SPRING	2	1.68	1.3200	2.03	0.50	0.36	30	1.32	1.32	1.68	2.03	2.03
12	SUMMER	2	1.75	1.4000	2.10	0.49	0.35	28	1.40	1.40	1.75	2.10	2.10
12	WINTER	2	1.71	1.4850	1.94	0.32	0.23	19	1.49	1.49	1.71	1.94	1.94
13	FALL	4	0.09	.00250	0.36	0.18	0.09	191	0.00	0.00	0.01	0.18	0.36
13	SPRING	1	0.63	.63000	0.63	.	.	.	0.63	0.63	0.63	0.63	0.63
13	SUMMER	10	0.11	.00050	0.73	0.23	0.07	208	0.00	0.00	0.01	0.09	0.73
13	WINTER	2	0.90	.01000	1.79	1.26	0.89	140	0.01	0.01	0.90	1.79	1.79
18	SUMMER	1	0.05	.05000	0.05	.	.	.	0.05	0.05	0.05	0.05	0.05
20	FALL	9	0.07	.00250	0.34	0.11	0.04	155	0.00	0.00	0.05	0.07	0.34
20	SPRING	2	0.01	.00500	0.01	0.00	0.00	24	0.01	0.01	0.01	0.01	0.01
20	SUMMER	6	0.02	.00000	0.12	0.05	0.02	203	0.00	0.01	0.01	0.01	0.12
20	WINTER	2	0.14	.13000	0.14	0.01	0.01	5	0.13	0.13	0.14	0.14	0.14
22	FALL	7	0.08	.02500	0.13	0.04	0.02	57	0.03	0.03	0.08	0.11	0.13
22	SPRING	8	0.08	.01000	0.28	0.10	0.04	126	0.01	0.02	0.03	0.13	0.28
22	SUMMER	11	0.08	.00000	0.36	0.11	0.03	147	0.00	0.01	0.04	0.09	0.36
22	WINTER	2	0.17	.14000	0.20	0.04	0.03	25	0.14	0.14	0.17	0.20	0.20
24	FALL	2	0.04	.01750	0.06	0.03	0.02	78	0.02	0.02	0.04	0.06	0.06
24	SPRING	16	0.78	.01000	3.68	1.24	0.31	160	0.01	0.01	0.03	1.23	3.68
24	SUMMER	8	0.46	.01000	3.20	1.11	0.39	243	0.01	0.02	0.06	0.15	3.20
24	WINTER	5	0.27	.01000	1.31	0.58	0.26	210	0.01	0.01	0.01	0.04	1.31
80	FALL	1	0.01	.00500	0.01	.	.	.	0.01	0.01	0.01	0.01	0.01
80	SPRING	1	0.02	.02000	0.02	.	.	.	0.02	0.02	0.02	0.02	0.02
80	SUMMER	3	0.00	.00100	0.01	0.00	0.00	79	0.00	0.00	0.01	0.01	0.01
80	WINTER	1	0.03	.03000	0.03	.	.	.	0.03	0.03	0.03	0.03	0.03
81	FALL	1	0.02	.01750	0.02	.	.	.	0.02	0.02	0.02	0.02	0.02

Data were not always available for all years.

Aggregate Nutrient Ecoregion: III
Lakes and Reservoirs
Descriptive Statistics by Subecoregion, Decade and Season
from 1990 to 1999
Nitrogen_Tot_Kjeldhal_mg_L

subecoregion	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
6	FALL	1	0.45	.45000	0.45	.	.	.	0.45	0.45	0.45	0.45	0.45
6	SPRING	4	0.40	.20000	0.60	0.23	0.12	58	0.20	0.20	0.40	0.60	0.60
6	SUMMER	1	0.45	.45000	0.45	.	.	.	0.45	0.45	0.45	0.45	0.45
6	WINTER	1	1.95	1.9500	1.95	.	.	.	1.95	1.95	1.95	1.95	1.95
10	FALL	8	0.83	.39000	1.34	0.32	0.11	39	0.39	0.66	0.72	1.10	1.34
10	SPRING	9	0.68	.25000	1.15	0.24	0.08	35	0.25	0.63	0.69	0.70	1.15
10	SUMMER	13	0.83	.23500	1.68	0.39	0.11	47	0.24	0.58	0.82	0.97	1.68
10	WINTER	7	0.70	.43000	1.16	0.26	0.10	37	0.43	0.51	0.64	0.93	1.16
12	FALL	2	0.26	.00000	0.52	0.37	0.26	141	0.00	0.00	0.26	0.52	0.52
12	SPRING	2	0.28	.00000	0.56	0.40	0.28	141	0.00	0.00	0.28	0.56	0.56
12	SUMMER	9	0.29	.00000	0.45	0.16	0.05	54	0.00	0.17	0.36	0.42	0.45
12	WINTER	2	0.33	.00000	0.66	0.46	0.33	141	0.00	0.00	0.33	0.66	0.66
13	FALL	20	0.64	.07250	2.23	0.50	0.11	78	0.11	0.29	0.55	0.85	1.74
13	SPRING	32	0.54	.02500	2.90	0.63	0.11	118	0.03	0.20	0.35	0.60	2.64
13	SUMMER	42	0.71	.07000	3.19	0.61	0.09	85	0.18	0.39	0.57	0.90	1.91
13	WINTER	9	1.12	.34000	2.48	0.82	0.27	73	0.34	0.48	0.90	1.40	2.48
18	FALL	2	0.30	.30000	0.30	0.00	0.00	0	0.30	0.30	0.30	0.30	0.30
18	SPRING	1	0.38	.38000	0.38	.	.	.	0.38	0.38	0.38	0.38	0.38
18	SUMMER	5	0.47	.32500	0.70	0.17	0.08	36	0.33	0.33	0.40	0.60	0.70
20	FALL	17	0.70	.02500	2.96	0.67	0.16	96	0.03	0.33	0.50	0.90	2.96
20	SPRING	24	0.39	.02500	3.19	0.65	0.13	168	0.03	0.08	0.18	0.47	0.93
20	SUMMER	26	0.42	.02500	2.83	0.54	0.11	127	0.06	0.19	0.30	0.45	0.80
20	WINTER	4	0.30	.06250	0.54	0.23	0.12	78	0.06	0.10	0.30	0.49	0.54
22	FALL	7	0.47	.18000	1.02	0.35	0.13	75	0.18	0.19	0.39	0.90	1.02
22	SPRING	8	0.58	.02500	1.68	0.63	0.22	109	0.03	0.13	0.36	0.99	1.68
22	SUMMER	12	0.72	.02500	2.20	0.59	0.17	81	0.03	0.32	0.63	0.95	2.20
22	WINTER	2	0.22	.22000	0.22	0.00	0.00	0	0.22	0.22	0.22	0.22	0.22
24	FALL	4	0.63	.22500	1.40	0.53	0.26	83	0.23	0.31	0.45	0.95	1.40
24	SPRING	12	1.32	.41000	3.51	0.96	0.28	72	0.41	0.54	1.00	1.75	3.51
24	SUMMER	10	0.66	.24000	1.20	0.34	0.11	52	0.24	0.38	0.59	0.89	1.20
24	WINTER	5	0.41	.29000	0.74	0.18	0.08	44	0.29	0.34	0.35	0.36	0.74
80	FALL	1	0.11	.11250	0.11	.	.	.	0.11	0.11	0.11	0.11	0.11
80	SPRING	1	0.20	.20000	0.20	.	.	.	0.20	0.20	0.20	0.20	0.20
80	SUMMER	4	0.46	.27500	0.70	0.20	0.10	44	0.28	0.29	0.43	0.62	0.70

Data were not always available for all years.

Aggregate Nutrient Ecoregion: III
Lakes and Reservoirs
Descriptive Statistics by Subecoregion, Decade and Season
from 1990 to 1999
Nitrogen_Tot_Kjeldhal_mg_L

subecoregion	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
80	WINTER	1	0.05	.05000	0.05	.	.	.	0.05	0.05	0.05	0.05	0.05
81	FALL	1	0.50	.50000	0.50	.	.	.	0.50	0.50	0.50	0.50	0.50

Data were not always available for all years.

Aggregate Nutrient Ecoregion: III
Lakes and Reservoirs
Descriptive Statistics by Subecoregion, Decade and Season
from 1990 to 1998
SECCHI_m

subecoregion	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
6	FALL	2	1.38	.75000	2.00	0.88	0.63	64	0.75	0.75	1.38	2.00	2.00
6	SPRING	2	1.47	1.0775	1.86	0.55	0.39	37	1.08	1.08	1.47	1.86	1.86
6	SUMMER	2	1.18	.94000	1.42	0.34	0.24	29	0.94	0.94	1.18	1.42	1.42
10	FALL	4	1.94	1.5250	2.30	0.33	0.17	17	1.53	1.69	1.96	2.19	2.30
10	SPRING	4	1.52	1.1250	2.40	0.60	0.30	40	1.13	1.14	1.28	1.90	2.40
10	SUMMER	7	1.45	.10000	2.50	0.71	0.27	49	0.10	1.35	1.50	1.80	2.50
10	WINTER	3	2.31	2.0000	2.63	0.31	0.18	14	2.00	2.00	2.30	2.63	2.63
12	SUMMER	15	1.98	.50000	4.60	1.30	0.34	66	0.50	1.13	1.50	2.20	4.60
13	FALL	19	1.37	.17500	7.00	1.68	0.39	122	0.18	0.30	0.83	2.20	7.00
13	SPRING	23	1.38	.10000	4.30	1.41	0.29	102	0.10	0.23	0.60	2.88	4.00
13	SUMMER	36	1.57	.02500	5.50	1.36	0.23	87	0.20	0.33	1.28	2.36	4.50
13	WINTER	5	0.98	.50000	1.70	0.48	0.21	49	0.50	0.60	1.00	1.10	1.70
18	FALL	5	2.55	1.1049	4.50	1.54	0.69	61	1.10	1.45	1.78	3.90	4.50
18	SPRING	2	2.30	1.6000	3.00	0.99	0.70	43	1.60	1.60	2.30	3.00	3.00
18	SUMMER	9	2.57	.68580	5.70	1.66	0.55	65	0.69	1.50	2.35	3.00	5.70
20	FALL	18	3.10	1.4000	5.20	1.16	0.27	37	1.40	2.30	2.73	3.90	5.20
20	SPRING	19	2.58	.96000	4.03	0.93	0.21	36	0.96	1.90	2.55	3.20	4.03
20	SUMMER	33	2.75	.90000	7.80	1.42	0.25	52	0.90	2.10	2.40	3.15	5.70
20	WINTER	2	2.64	2.1000	3.18	0.76	0.54	29	2.10	2.10	2.64	3.18	3.18
22	FALL	7	2.22	.75000	4.28	1.30	0.49	59	0.75	0.85	2.10	3.23	4.28
22	SPRING	5	2.04	.80000	4.00	1.27	0.57	62	0.80	1.10	1.85	2.43	4.00
22	SUMMER	8	1.88	.15000	3.80	1.34	0.47	71	0.15	0.75	1.85	2.95	3.80
24	FALL	4	1.26	.54000	2.67	1.00	0.50	79	0.54	0.55	0.93	1.98	2.67
24	SPRING	10	0.86	.20000	2.84	0.81	0.26	95	0.20	0.30	0.73	1.00	2.84
24	SUMMER	5	1.02	.20000	3.00	1.14	0.51	112	0.20	0.33	0.74	0.83	3.00
24	WINTER	2	2.20	.81000	3.59	1.96	1.39	89	0.81	0.81	2.20	3.59	3.59
80	FALL	1	2.90	2.9000	2.90	.	.	.	2.90	2.90	2.90	2.90	2.90
80	SUMMER	6	2.15	.50000	4.60	1.39	0.57	65	0.50	1.50	1.80	2.70	4.60
81	FALL	1	1.76	1.7563	1.76	.	.	.	1.76	1.76	1.76	1.76	1.76

Data were not always available for all years.

Aggregate Nutrient Ecoregion: III
Lakes and Reservoirs
Descriptive Statistics by Subecoregion, Decade and Season
from 1990 to 1998
Total_Nitrogen_mg_L

subecoregion	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
10	FALL	3	0.28	.26500	0.29	0.01	0.01	5	0.27	0.27	0.28	0.29	0.29
10	SPRING	3	0.49	.46000	0.52	0.03	0.02	6	0.46	0.46	0.51	0.52	0.52
10	SUMMER	3	0.27	.27000	0.28	0.00	0.00	1	0.27	0.27	0.27	0.28	0.28
10	WINTER	3	0.47	.45250	0.48	0.01	0.01	3	0.45	0.45	0.47	0.48	0.48
13	FALL	7	0.89	.18000	2.28	0.70	0.26	78	0.18	0.32	0.81	1.18	2.28
13	SPRING	4	1.20	.52000	2.72	1.04	0.52	86	0.52	0.53	0.79	1.88	2.72
13	SUMMER	7	1.16	.47000	2.42	0.78	0.29	67	0.47	0.48	0.69	1.93	2.42
13	WINTER	3	1.20	.60000	2.32	0.97	0.56	81	0.60	0.60	0.68	2.32	2.32
22	FALL	7	0.56	.29000	1.07	0.33	0.13	59	0.29	0.30	0.46	1.00	1.07
22	SPRING	8	0.71	.16500	1.96	0.65	0.23	92	0.17	0.29	0.48	1.02	1.96
22	SUMMER	9	0.73	.15500	2.41	0.69	0.23	94	0.16	0.32	0.65	0.71	2.41
22	WINTER	2	0.39	.36000	0.42	0.04	0.03	11	0.36	0.36	0.39	0.42	0.42
24	FALL	2	0.42	.28125	0.56	0.20	0.14	47	0.28	0.28	0.42	0.56	0.56
24	SPRING	11	1.55	.45000	4.33	1.31	0.40	85	0.45	0.57	0.89	1.90	4.33
24	SUMMER	5	0.97	.80000	1.30	0.20	0.09	20	0.80	0.84	0.93	0.99	1.30

Data were not always available for all years.

Aggregate Nutrient Ecoregion: III
Lakes and Reservoirs
Descriptive Statistics by Subecoregion, Decade and Season
from 1990 to 1999
Total_Phosphorus_ug_L

subecoregion	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
6	FALL	5	316.00	75.000	495.00	186	83.1	59	75.0	160	420	430	495
6	SPRING	7	97.86	30.000	165.00	60.5	22.9	62	30.0	30.0	120	150	165
6	SUMMER	6	199.58	35.000	357.50	103	41.9	51	35.0	185	200	220	358
6	WINTER	4	216.25	190.00	260.00	32.0	16.0	15	190	193	208	240	260
10	FALL	11	93.48	30.000	260.00	77.7	23.4	83	30.0	35.5	55.0	132	260
10	SPRING	12	66.71	40.000	150.00	31.5	9.09	47	40.0	41.5	60.3	79.3	150
10	SUMMER	17	104.43	26.750	410.00	105	25.5	101	26.8	35.0	62.5	95.0	410
10	WINTER	10	77.30	30.000	156.00	44.4	14.0	57	30.0	32.8	78.5	114	156
12	FALL	2	85.00	20.000	150.00	91.9	65.0	108	20.0	20.0	85.0	150	150
12	SPRING	2	82.50	15.000	150.00	95.5	67.5	116	15.0	15.0	82.5	150	150
12	SUMMER	18	85.14	.00000	260.00	80.2	18.9	94	0.00	20.0	62.5	165	260
12	WINTER	2	91.25	27.500	155.00	90.2	63.8	99	27.5	27.5	91.3	155	155
13	FALL	26	153.49	15.000	755.00	182	35.8	119	15.0	35.0	88.8	185	610
13	SPRING	33	81.44	2.5000	730.00	140	24.4	172	6.25	20.0	42.5	70.0	435
13	SUMMER	49	85.43	6.2500	690.00	140	20.0	164	6.25	25.0	30.0	80.0	440
13	WINTER	10	213.50	40.000	800.00	263	83.3	123	40.0	60.0	90.0	220	800
18	FALL	6	30.00	10.000	100.00	34.5	14.1	115	10.0	12.5	18.8	20.0	100
18	SPRING	3	9.58	2.5000	20.00	9.21	5.32	96	2.50	2.50	6.25	20.0	20.0
18	SUMMER	11	192.50	10.000	1200.00	384	116	199	10.0	10.0	20.0	110	1200
20	FALL	25	40.63	2.5000	390.00	82.8	16.6	204	2.50	4.38	10.0	32.5	175
20	SPRING	24	41.70	1.5000	265.00	58.9	12.0	141	2.50	9.06	23.8	42.5	150
20	SUMMER	38	15.57	.00000	75.00	18.6	3.01	119	0.00	2.50	10.0	15.0	62.5
20	WINTER	6	6.88	2.5000	10.00	3.69	1.51	54	2.50	2.50	8.13	10.0	10.0
22	FALL	10	36.00	.00000	135.00	41.5	13.1	115	0.00	10.0	20.0	60.0	135
22	SPRING	6	43.96	2.5000	135.00	58.5	23.9	133	2.50	2.50	11.9	100	135
22	SUMMER	15	57.50	2.5000	200.00	51.1	13.2	89	2.50	20.0	45.0	70.0	200
22	WINTER	2	30.00	30.000	30.00	0.00	0.00	0	30.0	30.0	30.0	30.0	30.0
24	FALL	4	22.81	10.000	50.00	18.7	9.33	82	10.0	10.6	15.6	35.0	50.0
24	SPRING	16	283.79	15.625	1630.00	467	117	164	15.6	25.0	55.0	260	1630
24	SUMMER	9	31.53	11.250	65.00	19.0	6.33	60	11.3	20.0	20.0	35.0	65.0
24	WINTER	6	43.33	20.000	70.00	16.0	6.54	37	20.0	40.0	42.5	45.0	70.0
80	FALL	1	82.50	82.500	82.50	.	.	.	82.5	82.5	82.5	82.5	82.5
80	SPRING	1	90.00	90.000	90.00	.	.	.	90.0	90.0	90.0	90.0	90.0
80	SUMMER	7	83.21	20.000	140.00	42.0	15.9	50	20.0	52.5	80.0	130	140

Data were not always available for all years.

Aggregate Nutrient Ecoregion: III
Lakes and Reservoirs
Descriptive Statistics by Subecoregion, Decade and Season
from 1990 to 1999
Total_Phosphorus_ug_L

subecoregion	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
80	WINTER	1	90.00	90.000	90.00	.	.	.	90.0	90.0	90.0	90.0	90.0
81	FALL	1	20.00	20.000	20.00	.	.	.	20.0	20.0	20.0	20.0	20.0

Data were not always available for all years.

Aggregate Nutrient Ecoregion: III
Lakes and Reservoirs
Descriptive Statistics by Subecoregion, Decade and Season
from 1991 to 1999
pH_S_U

subecoregion	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
10	FALL	8	8.42	8.0000	9.05	0.34	0.12	4	8.00	8.19	8.38	8.58	9.05
10	SPRING	8	8.38	8.1000	8.70	0.20	0.07	2	8.10	8.25	8.34	8.53	8.70
10	SUMMER	9	8.39	7.2750	9.30	0.65	0.22	8	7.28	8.03	8.30	8.80	9.30
10	WINTER	8	8.19	8.0250	8.60	0.19	0.07	2	8.03	8.08	8.10	8.28	8.60
12	FALL	2	8.18	8.1700	8.18	0.01	0.00	0	8.17	8.17	8.18	8.18	8.18
12	SPRING	2	8.04	7.9400	8.13	0.13	0.10	2	7.94	7.94	8.04	8.13	8.13
12	SUMMER	11	8.33	7.8350	9.48	0.45	0.14	5	7.84	8.08	8.18	8.50	9.48
12	WINTER	2	8.13	8.0675	8.18	0.08	0.06	1	8.07	8.07	8.13	8.18	8.18
13	SUMMER	4	8.32	8.2400	8.51	0.13	0.06	2	8.24	8.24	8.27	8.41	8.51
18	SUMMER	2	7.61	7.3150	7.91	0.42	0.30	6	7.32	7.32	7.61	7.91	7.91
20	SUMMER	2	8.25	8.1050	8.40	0.21	0.15	3	8.11	8.11	8.25	8.40	8.40
22	SUMMER	2	8.22	8.0500	8.39	0.24	0.17	3	8.05	8.05	8.22	8.39	8.39
80	SUMMER	3	7.22	6.3000	7.88	0.82	0.47	11	6.30	6.30	7.48	7.88	7.88

Data were not always available for all years.

Lakes and Reservoirs
Descriptive Statistics by Subecoregion, Year and Season
from 1990 to 1999
Chloro_A_Fluor_cor_ug_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
6	1996	FALL	1	2.80	2.8000	2.80	.	.	.	2.80	2.80	2.80	2.80	2.80
6	1996	WINTER	1	4.50	4.5000	4.50	.	.	.	4.50	4.50	4.50	4.50	4.50
6	1997	FALL	1	46.50	46.500	46.50	.	.	.	46.50	46.50	46.50	46.50	46.50
6	1997	SUMMER	1	32.00	32.000	32.00	.	.	.	32.00	32.00	32.00	32.00	32.00
10	1994	FALL	3	5.88	4.6000	7.45	1.45	0.83	25	4.60	4.60	5.60	7.45	7.45
10	1994	SPRING	3	7.23	5.3500	10.55	2.88	1.66	40	5.35	5.35	5.80	10.55	10.55
10	1994	SUMMER	3	2.85	2.3000	3.35	0.53	0.30	18	2.30	2.30	2.90	3.35	3.35
10	1995	FALL	3	8.07	7.1000	8.70	0.85	0.49	11	7.10	7.10	8.40	8.70	8.70
10	1995	SPRING	3	5.53	5.3000	5.80	0.25	0.15	5	5.30	5.30	5.50	5.80	5.80
10	1995	SUMMER	3	1.70	1.5000	1.80	0.17	0.10	10	1.50	1.50	1.80	1.80	1.80
10	1995	WINTER	3	2.42	1.4500	3.20	0.89	0.51	37	1.45	1.45	2.60	3.20	3.20
10	1998	SUMMER	1	0.90	.90000	0.90	.	.	.	0.90	0.90	0.90	0.90	0.90
12	1997	SUMMER	3	28.20	20.600	40.50	10.75	6.21	38	20.60	20.60	23.50	40.50	40.50
12	1998	SUMMER	8	14.94	1.2000	47.60	16.91	5.98	113	1.20	2.25	7.35	25.75	47.60
13	1997	SUMMER	3	2.40	1.7000	3.40	0.89	0.51	37	1.70	1.70	2.10	3.40	3.40
13	1998	SUMMER	1	5.50	5.5000	5.50	.	.	.	5.50	5.50	5.50	5.50	5.50
18	1997	SUMMER	1	5.30	5.3000	5.30	.	.	.	5.30	5.30	5.30	5.30	5.30
18	1998	SUMMER	1	4.00	4.0000	4.00	.	.	.	4.00	4.00	4.00	4.00	4.00
20	1999	SUMMER	2	1.50	.00000	3.00	2.12	1.50	141	0.00	0.00	1.50	3.00	3.00
22	1999	SUMMER	1	2.50	2.5000	2.50	.	.	.	2.50	2.50	2.50	2.50	2.50
80	1990	SPRING	1	6.80	6.8000	6.80	.	.	.	6.80	6.80	6.80	6.80	6.80
80	1990	SUMMER	1	2.15	2.1500	2.15	.	.	.	2.15	2.15	2.15	2.15	2.15
80	1991	SUMMER	2	3.55	.70000	6.40	4.03	2.85	114	0.70	0.70	3.55	6.40	6.40
80	1992	FALL	1	1.90	1.9000	1.90	.	.	.	1.90	1.90	1.90	1.90	1.90
80	1992	SUMMER	2	4.05	2.8000	5.30	1.77	1.25	44	2.80	2.80	4.05	5.30	5.30
80	1993	FALL	1	3.60	3.6000	3.60	.	.	.	3.60	3.60	3.60	3.60	3.60
80	1993	SUMMER	1	4.40	4.4000	4.40	.	.	.	4.40	4.40	4.40	4.40	4.40
80	1994	FALL	1	28.00	28.000	28.00	.	.	.	28.00	28.00	28.00	28.00	28.00
80	1994	SPRING	1	4.40	4.4000	4.40	.	.	.	4.40	4.40	4.40	4.40	4.40
80	1995	FALL	1	10.00	10.000	10.00	.	.	.	10.00	10.00	10.00	10.00	10.00
80	1995	SPRING	1	2.40	2.4000	2.40	.	.	.	2.40	2.40	2.40	2.40	2.40
80	1995	SUMMER	1	7.10	7.1000	7.10	.	.	.	7.10	7.10	7.10	7.10	7.10

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Chloro_A_Fluor_cor_ug_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
80	1996	FALL	1	3.90	3.9000	3.90	.	.	.	3.90	3.90	3.90	3.90	3.90
80	1996	SPRING	1	4.70	4.7000	4.70	.	.	.	4.70	4.70	4.70	4.70	4.70
80	1996	SUMMER	1	23.00	23.000	23.00	.	.	.	23.00	23.00	23.00	23.00	23.00
80	1997	FALL	1	6.60	6.6000	6.60	.	.	.	6.60	6.60	6.60	6.60	6.60
80	1997	SPRING	1	3.60	3.6000	3.60	.	.	.	3.60	3.60	3.60	3.60	3.60
80	1997	SUMMER	2	4.30	3.4000	5.20	1.27	0.90	30	3.40	3.40	4.30	5.20	5.20
80	1998	SUMMER	1	3.80	3.8000	3.80	.	.	.	3.80	3.80	3.80	3.80	3.80

Aggregate Nutrient Ecoregion: III
Lakes and Reservoirs
Descriptive Statistics by Subecoregion, Year and Season
from 1990 to 1997
Chloro_A_Phyto_Spec_A_ug_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
13	1990	FALL	5	25.32	3.0000	83.40	33.56	15.01	133	3.00	6.60	8.50	25.10	83.40
13	1990	SPRING	4	3.28	2.6000	3.80	0.54	0.27	16	2.60	2.85	3.35	3.70	3.80
13	1990	SUMMER	21	11.53	1.8000	45.50	13.63	2.97	118	2.00	4.00	5.50	12.50	43.30
13	1991	FALL	1	9.40	9.4000	9.40	.	.	.	9.40	9.40	9.40	9.40	9.40
13	1991	SPRING	6	14.60	2.1000	23.70	9.84	4.02	67	2.10	2.75	18.38	22.30	23.70
13	1991	SUMMER	6	43.30	9.3500	94.20	31.50	12.86	73	9.35	19.05	37.35	62.50	94.20
13	1991	WINTER	2	29.90	29.900	29.90	0.00	0.00	0	29.90	29.90	29.90	29.90	29.90
13	1992	FALL	11	11.11	2.6000	41.35	10.97	3.31	99	2.60	4.80	7.45	13.30	41.35
13	1992	SPRING	16	4.88	.80000	19.00	4.80	1.20	98	0.80	1.75	2.90	6.98	19.00
13	1992	SUMMER	7	11.03	1.2500	41.55	13.96	5.28	127	1.25	3.50	5.10	12.00	41.55
13	1992	WINTER	2	7.65	2.8000	12.50	6.86	4.85	90	2.80	2.80	7.65	12.50	12.50
13	1993	FALL	3	2.50	1.7000	3.00	0.70	0.40	28	1.70	1.70	2.80	3.00	3.00
13	1993	SPRING	1	0.80	.80000	0.80	.	.	.	0.80	0.80	0.80	0.80	0.80
13	1993	SUMMER	6	11.12	.90000	27.35	10.13	4.14	91	0.90	4.65	7.15	19.50	27.35
13	1994	FALL	1	23.60	23.600	23.60	.	.	.	23.60	23.60	23.60	23.60	23.60
13	1994	SPRING	1	6.00	6.0000	6.00	.	.	.	6.00	6.00	6.00	6.00	6.00
13	1994	SUMMER	21	11.42	1.6500	52.60	13.97	3.05	122	1.70	2.15	4.20	18.80	37.40
13	1994	WINTER	1	8.40	8.4000	8.40	.	.	.	8.40	8.40	8.40	8.40	8.40
13	1995	FALL	4	8.85	2.4000	15.70	6.82	3.41	77	2.40	3.00	8.65	14.70	15.70
13	1995	SPRING	1	12.35	12.350	12.35	.	.	.	12.35	12.35	12.35	12.35	12.35
13	1995	SUMMER	8	8.58	3.5000	16.30	4.59	1.62	54	3.50	5.43	7.23	11.75	16.30
13	1995	WINTER	1	27.20	27.200	27.20	.	.	.	27.20	27.20	27.20	27.20	27.20
13	1996	FALL	8	9.44	1.9000	26.50	7.82	2.77	83	1.90	4.80	6.50	12.28	26.50
13	1996	SUMMER	20	4.88	1.1500	37.70	8.06	1.80	165	1.23	1.60	2.53	3.40	23.95
18	1991	SUMMER	3	5.92	1.4000	8.30	3.91	2.26	66	1.40	1.40	8.05	8.30	8.30
18	1992	SPRING	1	2.10	2.1000	2.10	.	.	.	2.10	2.10	2.10	2.10	2.10
18	1993	SUMMER	4	3.91	1.0000	7.40	2.72	1.36	69	1.00	1.90	3.63	5.93	7.40
18	1994	SUMMER	1	1.50	1.5000	1.50	.	.	.	1.50	1.50	1.50	1.50	1.50
18	1995	FALL	2	6.13	2.4000	9.85	5.27	3.73	86	2.40	2.40	6.13	9.85	9.85
18	1995	SPRING	2	1.35	.30000	2.40	1.48	1.05	110	0.30	0.30	1.35	2.40	2.40
18	1995	SUMMER	4	2.04	.85000	3.85	1.41	0.70	69	0.85	0.93	1.73	3.15	3.85
18	1996	SUMMER	3	1.48	.60000	2.55	0.99	0.57	67	0.60	0.60	1.30	2.55	2.55

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Descriptive Statistics by Subecoregion, Year and Season
from 1990 to 1997
Chloro_A_Phyto_Spec_A_ug_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
20	1990	FALL	2	17.18	13.050	21.30	5.83	4.13	34	13.05	13.05	17.18	21.30	21.30
20	1990	SPRING	3	3.72	1.9000	4.95	1.61	0.93	43	1.90	1.90	4.30	4.95	4.95
20	1990	SUMMER	10	3.20	1.2000	8.10	2.30	0.73	72	1.20	1.90	2.13	5.20	8.10
20	1991	FALL	3	2.90	.40000	6.10	2.91	1.68	100	0.40	0.40	2.20	6.10	6.10
20	1991	SPRING	9	2.68	1.5000	4.85	1.14	0.38	43	1.50	2.00	2.10	3.00	4.85
20	1991	SUMMER	14	2.44	.90000	5.65	1.18	0.32	48	0.90	1.70	2.45	2.70	5.65
20	1991	WINTER	1	1.65	1.6500	1.65	.	.	.	1.65	1.65	1.65	1.65	1.65
20	1992	FALL	7	3.17	.20000	8.00	2.74	1.03	86	0.20	1.00	2.10	5.20	8.00
20	1992	SPRING	7	2.44	.30000	7.30	2.55	0.97	105	0.30	0.55	1.25	4.50	7.30
20	1992	SUMMER	6	1.98	.70000	2.80	0.86	0.35	43	0.70	1.20	2.30	2.60	2.80
20	1993	FALL	6	1.18	.30000	3.10	1.24	0.51	106	0.30	0.30	0.48	2.40	3.10
20	1993	SPRING	3	1.55	1.0000	1.90	0.48	0.28	31	1.00	1.00	1.75	1.90	1.90
20	1993	SUMMER	14	2.25	.00000	6.90	2.05	0.55	91	0.00	0.70	1.53	4.10	6.90
20	1994	FALL	7	10.31	1.3000	40.70	14.30	5.41	139	1.30	1.40	5.40	15.65	40.70
20	1994	SUMMER	11	5.91	.70000	42.20	12.10	3.65	205	0.70	1.10	2.50	3.20	42.20
20	1995	FALL	12	3.07	.90000	7.50	2.02	0.58	66	0.90	1.78	2.23	4.45	7.50
20	1995	SPRING	2	1.75	1.1000	2.40	0.92	0.65	53	1.10	1.10	1.75	2.40	2.40
20	1995	SUMMER	20	5.90	.50000	58.30	12.58	2.81	213	0.70	1.38	2.50	4.80	34.40
20	1995	WINTER	1	1.20	1.2000	1.20	.	.	.	1.20	1.20	1.20	1.20	1.20
20	1996	FALL	4	1.38	1.1000	1.60	0.21	0.10	15	1.10	1.25	1.40	1.50	1.60
20	1996	SPRING	3	1.83	.50000	3.40	1.46	0.85	80	0.50	0.50	1.60	3.40	3.40
20	1996	SUMMER	8	6.59	.85000	33.80	11.37	4.02	173	0.85	1.15	1.93	5.95	33.80
20	1996	WINTER	1	0.20	.20000	0.20	.	.	.	0.20	0.20	0.20	0.20	0.20
22	1990	FALL	1	3.15	3.1500	3.15	.	.	.	3.15	3.15	3.15	3.15	3.15
22	1990	SPRING	1	2.73	2.7300	2.73	.	.	.	2.73	2.73	2.73	2.73	2.73
22	1990	SUMMER	1	11.45	11.450	11.45	.	.	.	11.45	11.45	11.45	11.45	11.45
22	1991	FALL	2	2.54	.72000	4.36	2.57	1.82	101	0.72	0.72	2.54	4.36	4.36
22	1991	SPRING	2	2.11	1.2150	3.00	1.26	0.89	60	1.22	1.22	2.11	3.00	3.00
22	1991	SUMMER	2	4.05	1.1450	6.96	4.11	2.91	101	1.15	1.15	4.05	6.96	6.96
22	1993	SUMMER	1	5.42	5.4200	5.42	.	.	.	5.42	5.42	5.42	5.42	5.42
22	1995	FALL	1	2.33	2.3300	2.33	.	.	.	2.33	2.33	2.33	2.33	2.33
22	1995	SPRING	1	2.71	2.7100	2.71	.	.	.	2.71	2.71	2.71	2.71	2.71

Lakes and Reservoirs
Descriptive Statistics by Subecoregion, Year and Season
from 1990 to 1997
Chloro_A_Phyto_Spec_A_ug_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
22	1995	SUMMER	1	2.83	2.8250	2.83	.	.	.	2.83	2.83	2.83	2.83	2.83
24	1990	FALL	3	14.10	9.4400	22.00	6.88	3.97	49	9.44	9.44	10.87	22.00	22.00
24	1990	SPRING	2	43.83	38.690	48.97	7.27	5.14	17	38.69	38.69	43.83	48.97	48.97
24	1990	SUMMER	3	13.71	2.5000	23.30	10.49	6.06	77	2.50	2.50	15.32	23.30	23.30
24	1991	SPRING	1	0.63	.62500	0.63	.	.	.	0.63	0.63	0.63	0.63	0.63
24	1991	SUMMER	2	7.25	1.0000	13.50	8.84	6.25	122	1.00	1.00	7.25	13.50	13.50
24	1992	FALL	1	0.25	.25000	0.25	.	.	.	0.25	0.25	0.25	0.25	0.25
24	1992	SPRING	4	1.74	.25000	4.67	1.99	1.00	115	0.25	0.54	1.02	2.94	4.67
24	1992	SUMMER	2	11.13	.25000	22.00	15.38	10.88	138	0.25	0.25	11.13	22.00	22.00
24	1992	WINTER	1	17.00	17.000	17.00	.	.	.	17.00	17.00	17.00	17.00	17.00
24	1993	FALL	1	0.25	.25000	0.25	.	.	.	0.25	0.25	0.25	0.25	0.25
24	1993	SPRING	3	8.91	1.9600	21.00	10.51	6.07	118	1.96	1.96	3.78	21.00	21.00
24	1993	SUMMER	2	17.70	2.5000	32.90	21.50	15.20	121	2.50	2.50	17.70	32.90	32.90
24	1993	WINTER	1	22.51	22.510	22.51	.	.	.	22.51	22.51	22.51	22.51	22.51
24	1994	SPRING	1	14.39	14.390	14.39	.	.	.	14.39	14.39	14.39	14.39	14.39
24	1995	SUMMER	4	41.26	.79000	155.80	76.39	38.20	185	0.79	1.56	4.23	80.97	155.80
24	1995	WINTER	1	3.50	3.5000	3.50	.	.	.	3.50	3.50	3.50	3.50	3.50
24	1996	SPRING	1	0.25	.25000	0.25	.	.	.	0.25	0.25	0.25	0.25	0.25
24	1996	SUMMER	1	15.40	15.400	15.40	.	.	.	15.40	15.40	15.40	15.40	15.40
24	1997	FALL	1	9.27	9.2650	9.27	.	.	.	9.27	9.27	9.27	9.27	9.27
24	1997	SPRING	1	4.64	4.6350	4.64	.	.	.	4.64	4.64	4.64	4.64	4.64
24	1997	SUMMER	1	7.26	7.2600	7.26	.	.	.	7.26	7.26	7.26	7.26	7.26

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Descriptive Statistics by Subecoregion, Year and Season
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Chloro_A_Trich_unco_ug_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
10	1993	SUMMER	2	38.50	11.000	66.00	38.89	27.50	101	11.00	11.00	38.50	66.00	66.00
10	1996	SUMMER	1	131.00	131.00	131.00	.	.	.	131.00	131.00	131.00	131.00	131.00
10	1997	SUMMER	1	1.00	1.0000	1.00	.	.	.	1.00	1.00	1.00	1.00	1.00
12	1990	SUMMER	4	41.94	1.0600	130.00	59.54	29.77	142	1.06	6.23	18.35	77.65	130.00
12	1991	SUMMER	3	8.15	4.7000	14.70	5.68	3.28	70	4.70	4.70	5.05	14.70	14.70
12	1992	SUMMER	2	11.15	8.0000	14.30	4.45	3.15	40	8.00	8.00	11.15	14.30	14.30
12	1993	SUMMER	2	2.40	.80000	4.00	2.26	1.60	94	0.80	0.80	2.40	4.00	4.00
12	1994	SUMMER	3	26.05	2.8000	57.55	28.29	16.33	109	2.80	2.80	17.80	57.55	57.55
12	1995	SUMMER	2	11.25	7.2000	15.30	5.73	4.05	51	7.20	7.20	11.25	15.30	15.30
12	1996	SUMMER	4	9.41	2.4000	13.50	4.85	2.43	52	2.40	6.40	10.88	12.43	13.50
12	1997	SUMMER	4	25.64	12.200	52.20	18.22	9.11	71	12.20	13.93	19.08	37.35	52.20
22	1990	FALL	1	3.43	3.4300	3.43	.	.	.	3.43	3.43	3.43	3.43	3.43
22	1990	SPRING	1	2.65	2.6450	2.65	.	.	.	2.65	2.65	2.65	2.65	2.65
22	1990	SUMMER	1	9.18	9.1750	9.18	.	.	.	9.18	9.18	9.18	9.18	9.18
22	1991	FALL	2	2.59	.74000	4.44	2.61	1.85	101	0.74	0.74	2.59	4.44	4.44
22	1991	SPRING	2	2.10	1.2350	2.97	1.23	0.87	58	1.24	1.24	2.10	2.97	2.97
22	1991	SUMMER	2	4.26	1.3500	7.17	4.11	2.91	97	1.35	1.35	4.26	7.17	7.17
22	1993	SUMMER	1	5.48	5.4800	5.48	.	.	.	5.48	5.48	5.48	5.48	5.48
22	1995	FALL	2	2.33	.40000	4.25	2.72	1.93	117	0.40	0.40	2.33	4.25	4.25
22	1995	SPRING	1	2.74	2.7400	2.74	.	.	.	2.74	2.74	2.74	2.74	2.74
22	1995	SUMMER	1	2.94	2.9350	2.94	.	.	.	2.94	2.94	2.94	2.94	2.94
24	1990	FALL	2	10.65	10.145	11.15	0.71	0.50	7	10.15	10.15	10.65	11.15	11.15
24	1990	SPRING	2	47.04	42.080	51.99	7.01	4.95	15	42.08	42.08	47.04	51.99	51.99
24	1990	SUMMER	2	21.66	17.020	26.30	6.56	4.64	30	17.02	17.02	21.66	26.30	26.30
24	1992	SPRING	3	2.35	.95000	4.69	2.04	1.18	87	0.95	0.95	1.42	4.69	4.69
24	1993	SPRING	2	3.34	2.7600	3.92	0.82	0.58	25	2.76	2.76	3.34	3.92	3.92
24	1995	SUMMER	2	1.66	.95000	2.37	1.00	0.71	60	0.95	0.95	1.66	2.37	2.37
24	1997	FALL	1	10.32	10.315	10.32	.	.	.	10.32	10.32	10.32	10.32	10.32
24	1997	SPRING	1	6.91	6.9050	6.91	.	.	.	6.91	6.91	6.91	6.91	6.91
24	1997	SUMMER	1	8.14	8.1350	8.14	.	.	.	8.14	8.14	8.14	8.14	8.14
80	1990	SUMMER	1	18.00	18.000	18.00	.	.	.	18.00	18.00	18.00	18.00	18.00
80	1993	SUMMER	1	0.60	.60000	0.60	.	.	.	0.60	0.60	0.60	0.60	0.60

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Chloro_A_Trich_unco_ug_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
80	1995	SUMMER	2	32.30	3.1000	61.50	41.30	29.20	128	3.10	3.10	32.30	61.50	61.50
80	1996	SUMMER	1	26.20	26.200	26.20	.	.	.	26.20	26.20	26.20	26.20	26.20

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Descriptive Statistics by Subecoregion, Year and Season
from 1991 to 1999
DIP_ug_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
10	1994	FALL	3	9.00	3.0000	17.00	7.21	4.16	80	3.00	3.00	7.00	17.00	17.00
10	1994	SPRING	3	1.67	1.0000	3.00	1.15	0.67	69	1.00	1.00	1.00	3.00	3.00
10	1994	SUMMER	3	4.33	3.0000	5.00	1.15	0.67	27	3.00	3.00	5.00	5.00	5.00
10	1994	WINTER	3	12.67	11.500	13.50	1.04	0.60	8	11.50	11.50	13.00	13.50	13.50
10	1995	FALL	2	2.00	2.0000	2.00	0.00	0.00	0	2.00	2.00	2.00	2.00	2.00
10	1995	SPRING	3	11.50	10.000	14.00	2.18	1.26	19	10.00	10.00	10.50	14.00	14.00
10	1995	SUMMER	3	5.33	4.0000	6.00	1.15	0.67	22	4.00	4.00	6.00	6.00	6.00
10	1995	WINTER	3	18.00	13.500	24.50	5.77	3.33	32	13.50	13.50	16.00	24.50	24.50
10	1998	FALL	5	62.00	2.0000	138.00	51.67	23.11	83	2.00	35.00	51.50	83.50	138.00
10	1998	SUMMER	5	54.80	.00000	139.00	71.53	31.99	131	0.00	4.00	4.00	127.00	139.00
10	1998	WINTER	3	74.00	40.000	122.00	42.76	24.68	58	40.00	40.00	60.00	122.00	122.00
10	1999	SPRING	5	33.70	19.500	47.00	11.45	5.12	34	19.50	26.00	33.00	43.00	47.00
10	1999	WINTER	4	58.88	22.000	88.00	31.31	15.66	53	22.00	33.00	62.75	84.75	88.00
12	1991	FALL	2	65.00	20.000	110.00	63.64	45.00	98	20.00	20.00	65.00	110.00	110.00
12	1991	SPRING	2	65.00	20.000	110.00	63.64	45.00	98	20.00	20.00	65.00	110.00	110.00
12	1991	SUMMER	2	80.00	20.000	140.00	84.85	60.00	106	20.00	20.00	80.00	140.00	140.00
12	1991	WINTER	2	67.50	20.000	115.00	67.18	47.50	100	20.00	20.00	67.50	115.00	115.00
12	1992	WINTER	2	72.50	15.000	130.00	81.32	57.50	112	15.00	15.00	72.50	130.00	130.00

Lakes and Reservoirs
Descriptive Statistics by Subecoregion, Year and Season
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Dissolved_Oxygen_mg_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
6	1990	FALL	1	4.05	4.0500	4.05	.	.	.	4.05	4.05	4.05	4.05	4.05
6	1990	SPRING	3	9.07	7.0000	10.20	1.79	1.03	20	7.00	7.00	10.00	10.20	10.20
6	1990	SUMMER	1	5.90	5.9000	5.90	.	.	.	5.90	5.90	5.90	5.90	5.90
6	1991	FALL	1	6.40	6.4000	6.40	.	.	.	6.40	6.40	6.40	6.40	6.40
6	1991	SPRING	1	7.60	7.6000	7.60	.	.	.	7.60	7.60	7.60	7.60	7.60
6	1991	SUMMER	1	3.55	3.5500	3.55	.	.	.	3.55	3.55	3.55	3.55	3.55
10	1990	FALL	3	8.47	5.5000	10.00	2.57	1.48	30	5.50	5.50	9.90	10.00	10.00
10	1990	SPRING	3	10.70	8.3000	12.60	2.19	1.27	20	8.30	8.30	11.20	12.60	12.60
10	1990	SUMMER	3	8.17	3.3000	13.50	5.12	2.95	63	3.30	3.30	7.70	13.50	13.50
10	1991	FALL	2	10.50	10.400	10.60	0.14	0.10	1	10.40	10.40	10.50	10.60	10.60
10	1991	SPRING	2	10.05	8.9000	11.20	1.63	1.15	16	8.90	8.90	10.05	11.20	11.20
10	1991	SUMMER	2	7.85	6.6000	9.10	1.77	1.25	23	6.60	6.60	7.85	9.10	9.10
10	1991	WINTER	1	12.20	12.200	12.20	.	.	.	12.20	12.20	12.20	12.20	12.20
10	1992	FALL	2	9.85	8.6000	11.10	1.77	1.25	18	8.60	8.60	9.85	11.10	11.10
10	1992	SPRING	2	8.88	8.3000	9.45	0.81	0.57	9	8.30	8.30	8.88	9.45	9.45
10	1992	SUMMER	2	7.85	6.9000	8.80	1.34	0.95	17	6.90	6.90	7.85	8.80	8.80
10	1992	WINTER	2	10.45	9.1000	11.80	1.91	1.35	18	9.10	9.10	10.45	11.80	11.80
10	1993	FALL	1	6.00	6.0000	6.00	.	.	.	6.00	6.00	6.00	6.00	6.00
10	1993	SPRING	2	9.15	9.0000	9.30	0.21	0.15	2	9.00	9.00	9.15	9.30	9.30
10	1993	SUMMER	6	6.10	1.5000	9.60	2.75	1.12	45	1.50	5.30	6.20	7.80	9.60
10	1993	WINTER	2	9.90	8.2000	11.60	2.40	1.70	24	8.20	8.20	9.90	11.60	11.60
10	1994	FALL	4	6.93	.85000	9.60	4.08	2.04	59	0.85	4.60	8.63	9.25	9.60
10	1994	SPRING	4	10.29	7.0000	11.95	2.23	1.11	22	7.00	9.03	11.10	11.55	11.95
10	1994	SUMMER	4	9.66	9.0500	10.60	0.66	0.33	7	9.05	9.28	9.50	10.05	10.60
10	1994	WINTER	3	11.23	10.500	11.70	0.64	0.37	6	10.50	10.50	11.50	11.70	11.70
10	1995	FALL	4	8.81	8.0000	9.35	0.61	0.30	7	8.00	8.35	8.95	9.28	9.35
10	1995	SPRING	4	11.23	9.9000	11.80	0.89	0.45	8	9.90	10.70	11.60	11.75	11.80
10	1995	SUMMER	4	8.99	8.0000	9.50	0.69	0.34	8	8.00	8.53	9.23	9.45	9.50
10	1995	WINTER	3	11.72	11.650	11.85	0.12	0.07	1	11.65	11.65	11.65	11.85	11.85
10	1996	SUMMER	2	9.88	8.7500	11.00	1.59	1.13	16	8.75	8.75	9.88	11.00	11.00
10	1997	SUMMER	1	6.00	6.0000	6.00	.	.	.	6.00	6.00	6.00	6.00	6.00
10	1998	FALL	5	9.02	7.3500	10.90	1.27	0.57	14	7.35	8.70	9.05	9.10	10.90

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subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
10	1998	SPRING	2	8.35	8.2000	8.50	0.21	0.15	3	8.20	8.20	8.35	8.50	8.50
10	1998	SUMMER	7	7.89	3.4000	9.50	2.11	0.80	27	3.40	7.70	8.60	9.40	9.50
10	1998	WINTER	3	11.40	11.000	11.80	0.40	0.23	4	11.00	11.00	11.40	11.80	11.80
10	1999	SPRING	5	10.72	9.9600	11.32	0.57	0.25	5	9.96	10.48	10.59	11.25	11.32
10	1999	WINTER	4	13.18	12.660	13.85	0.49	0.25	4	12.66	12.86	13.11	13.51	13.85
12	1990	SUMMER	5	8.32	6.7000	9.50	1.28	0.57	15	6.70	7.20	9.00	9.20	9.50
12	1991	FALL	2	7.65	6.7000	8.60	1.34	0.95	18	6.70	6.70	7.65	8.60	8.60
12	1991	SPRING	2	8.20	7.8000	8.60	0.57	0.40	7	7.80	7.80	8.20	8.60	8.60
12	1991	SUMMER	6	6.72	4.7000	8.40	1.34	0.55	20	4.70	5.85	6.78	7.80	8.40
12	1991	WINTER	2	8.55	8.1000	9.00	0.64	0.45	7	8.10	8.10	8.55	9.00	9.00
12	1992	SUMMER	3	7.87	5.0500	10.10	2.58	1.49	33	5.05	5.05	8.45	10.10	10.10
12	1992	WINTER	2	9.00	8.6000	9.40	0.57	0.40	6	8.60	8.60	9.00	9.40	9.40
12	1993	SUMMER	2	7.48	6.8500	8.10	0.88	0.62	12	6.85	6.85	7.48	8.10	8.10
12	1994	SUMMER	4	6.31	5.4000	7.60	1.08	0.54	17	5.40	5.43	6.13	7.20	7.60
12	1995	SUMMER	3	7.23	5.4500	8.60	1.62	0.93	22	5.45	5.45	7.65	8.60	8.60
12	1996	SUMMER	5	6.91	4.5000	8.20	1.45	0.65	21	4.50	6.75	7.40	7.70	8.20
12	1997	SUMMER	5	6.52	4.0000	8.10	1.80	0.80	28	4.00	5.25	7.50	7.75	8.10
13	1990	FALL	6	8.52	3.8000	13.20	3.63	1.48	43	3.80	6.70	7.45	12.50	13.20
13	1990	SPRING	6	9.00	7.8500	13.00	1.99	0.81	22	7.85	8.00	8.13	8.90	13.00
13	1990	SUMMER	21	7.23	5.8000	9.15	0.90	0.20	12	6.00	6.65	7.00	7.75	8.65
13	1991	FALL	1	7.00	7.0000	7.00	.	.	.	7.00	7.00	7.00	7.00	7.00
13	1991	SPRING	8	8.08	7.0000	9.00	0.69	0.24	9	7.00	7.50	8.18	8.63	9.00
13	1991	SUMMER	6	7.90	6.5500	9.65	1.28	0.52	16	6.55	7.10	7.38	9.35	9.65
13	1991	WINTER	3	9.38	7.5000	10.75	1.69	0.97	18	7.50	7.50	9.90	10.75	10.75
13	1992	FALL	11	8.25	5.6000	11.30	1.54	0.46	19	5.60	7.00	8.10	8.70	11.30
13	1992	SPRING	16	8.07	4.4500	12.50	2.15	0.54	27	4.45	6.68	7.80	9.60	12.50
13	1992	SUMMER	7	8.69	7.6000	10.40	0.91	0.34	10	7.60	8.00	8.60	9.15	10.40
13	1992	WINTER	2	5.90	2.2000	9.60	5.23	3.70	89	2.20	2.20	5.90	9.60	9.60
13	1993	FALL	3	8.15	7.4000	9.65	1.30	0.75	16	7.40	7.40	7.40	9.65	9.65
13	1993	SPRING	2	7.08	6.8000	7.35	0.39	0.27	5	6.80	6.80	7.08	7.35	7.35
13	1993	SUMMER	8	7.63	5.5000	9.50	1.29	0.46	17	5.50	6.65	7.88	8.48	9.50
13	1994	FALL	2	6.70	5.7000	7.70	1.41	1.00	21	5.70	5.70	6.70	7.70	7.70

Lakes and Reservoirs
Descriptive Statistics by Subecoregion, Year and Season
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Dissolved_Oxygen_mg_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
13	1994	SPRING	1	7.00	7.0000	7.00	.	.	.	7.00	7.00	7.00	7.00	7.00
13	1994	SUMMER	20	6.32	2.4000	8.55	1.51	0.34	24	2.70	5.88	6.80	7.18	8.33
13	1994	WINTER	1	2.50	2.5000	2.50	.	.	.	2.50	2.50	2.50	2.50	2.50
13	1995	FALL	3	5.58	3.5500	7.70	2.08	1.20	37	3.55	3.55	5.50	7.70	7.70
13	1995	SPRING	4	7.55	5.8000	9.10	1.37	0.68	18	5.80	6.60	7.65	8.50	9.10
13	1995	SUMMER	8	6.49	2.1000	8.20	2.07	0.73	32	2.10	5.80	6.95	8.05	8.20
13	1995	WINTER	1	4.50	4.5000	4.50	.	.	.	4.50	4.50	4.50	4.50	4.50
13	1996	FALL	8	6.70	1.8500	10.65	2.48	0.88	37	1.85	5.95	6.70	7.90	10.65
13	1996	SUMMER	20	6.72	2.1000	10.50	1.89	0.42	28	3.18	6.00	6.90	7.80	10.15
18	1991	SUMMER	2	5.15	2.4000	7.90	3.89	2.75	76	2.40	2.40	5.15	7.90	7.90
18	1992	SPRING	1	8.35	8.3500	8.35	.	.	.	8.35	8.35	8.35	8.35	8.35
18	1993	SUMMER	4	9.43	8.4000	10.40	0.93	0.47	10	8.40	8.65	9.45	10.20	10.40
18	1994	SUMMER	3	9.30	6.6000	10.90	2.35	1.36	25	6.60	6.60	10.40	10.90	10.90
18	1995	FALL	4	4.95	1.6500	7.20	2.48	1.24	50	1.65	3.08	5.48	6.83	7.20
18	1995	SUMMER	6	5.97	2.5500	8.20	2.05	0.84	34	2.55	5.35	5.88	7.95	8.20
18	1996	FALL	2	7.05	6.9000	7.20	0.21	0.15	3	6.90	6.90	7.05	7.20	7.20
18	1996	SUMMER	2	7.90	6.7000	9.10	1.70	1.20	21	6.70	6.70	7.90	9.10	9.10
20	1990	FALL	1	7.30	7.3000	7.30	.	.	.	7.30	7.30	7.30	7.30	7.30
20	1990	SPRING	5	8.07	7.4500	9.20	0.67	0.30	8	7.45	7.75	7.95	8.00	9.20
20	1990	SUMMER	13	7.38	4.3000	11.05	1.88	0.52	25	4.30	6.20	7.55	8.60	11.05
20	1991	FALL	5	8.24	5.4500	11.30	2.49	1.12	30	5.45	6.80	7.25	10.40	11.30
20	1991	SPRING	12	6.78	.30000	9.15	2.78	0.80	41	0.30	6.28	7.78	8.45	9.15
20	1991	SUMMER	14	6.58	4.9000	9.30	1.38	0.37	21	4.90	5.40	6.55	7.35	9.30
20	1991	WINTER	1	4.55	4.5500	4.55	.	.	.	4.55	4.55	4.55	4.55	4.55
20	1992	FALL	5	8.21	6.3000	10.00	1.65	0.74	20	6.30	6.70	8.55	9.50	10.00
20	1992	SPRING	10	6.18	2.0000	9.55	2.61	0.82	42	2.00	4.00	6.60	8.20	9.55
20	1992	SUMMER	6	6.92	6.2500	7.45	0.51	0.21	7	6.25	6.30	7.10	7.30	7.45
20	1992	WINTER	1	10.60	10.600	10.60	.	.	.	10.60	10.60	10.60	10.60	10.60
20	1993	FALL	8	7.68	4.1500	11.30	1.99	0.70	26	4.15	7.10	7.55	8.35	11.30
20	1993	SPRING	3	8.18	8.0500	8.30	0.13	0.07	2	8.05	8.05	8.20	8.30	8.30
20	1993	SUMMER	12	6.67	3.5500	7.80	1.18	0.34	18	3.55	6.35	6.90	7.45	7.80
20	1994	FALL	6	7.75	6.8000	9.10	0.97	0.39	12	6.80	6.85	7.58	8.60	9.10

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
20	1994	SPRING	1	8.10	8.1000	8.10	.	.	.	8.10	8.10	8.10	8.10	8.10
20	1994	SUMMER	11	6.12	2.7000	9.05	1.92	0.58	31	2.70	4.55	6.30	7.45	9.05
20	1994	WINTER	1	6.80	6.8000	6.80	.	.	.	6.80	6.80	6.80	6.80	6.80
20	1995	FALL	11	5.19	.20000	9.80	3.20	0.96	62	0.20	2.80	6.70	7.85	9.80
20	1995	SPRING	3	9.67	8.6000	10.95	1.19	0.69	12	8.60	8.60	9.45	10.95	10.95
20	1995	SUMMER	22	6.82	4.2000	10.70	1.57	0.34	23	4.70	5.55	6.98	7.45	9.60
20	1995	WINTER	1	9.20	9.2000	9.20	.	.	.	9.20	9.20	9.20	9.20	9.20
20	1996	FALL	5	7.35	4.3500	8.65	1.72	0.77	23	4.35	7.70	7.85	8.20	8.65
20	1996	SPRING	7	7.79	6.5500	9.35	1.09	0.41	14	6.55	7.25	7.30	9.30	9.35
20	1996	SUMMER	10	7.43	4.8000	10.50	1.91	0.60	26	4.80	5.95	6.85	8.55	10.50
20	1996	WINTER	1	8.40	8.4000	8.40	.	.	.	8.40	8.40	8.40	8.40	8.40
20	1997	SPRING	1	10.10	10.100	10.10	.	.	.	10.10	10.10	10.10	10.10	10.10
20	1999	SUMMER	2	6.42	6.1500	6.69	0.38	0.27	6	6.15	6.15	6.42	6.69	6.69
22	1990	FALL	1	7.20	7.2000	7.20	.	.	.	7.20	7.20	7.20	7.20	7.20
22	1990	SUMMER	1	1.70	1.7000	1.70	.	.	.	1.70	1.70	1.70	1.70	1.70
22	1991	SUMMER	1	2.70	2.7000	2.70	.	.	.	2.70	2.70	2.70	2.70	2.70
22	1992	SUMMER	1	0.40	.40000	0.40	.	.	.	0.40	0.40	0.40	0.40	0.40
22	1993	SUMMER	2	4.15	3.6000	4.70	0.78	0.55	19	3.60	3.60	4.15	4.70	4.70
22	1994	SUMMER	1	0.40	.40000	0.40	.	.	.	0.40	0.40	0.40	0.40	0.40
22	1995	FALL	1	8.40	8.4000	8.40	.	.	.	8.40	8.40	8.40	8.40	8.40
22	1995	SUMMER	1	0.10	.10000	0.10	.	.	.	0.10	0.10	0.10	0.10	0.10
22	1996	SPRING	1	6.30	6.3000	6.30	.	.	.	6.30	6.30	6.30	6.30	6.30
22	1999	SUMMER	2	8.82	8.3000	9.34	0.74	0.52	8	8.30	8.30	8.82	9.34	9.34
24	1990	FALL	2	10.50	6.3000	14.70	5.94	4.20	57	6.30	6.30	10.50	14.70	14.70
24	1990	SPRING	1	9.10	9.1000	9.10	.	.	.	9.10	9.10	9.10	9.10	9.10
24	1990	SUMMER	1	7.80	7.8000	7.80	.	.	.	7.80	7.80	7.80	7.80	7.80
24	1990	WINTER	1	9.60	9.6000	9.60	.	.	.	9.60	9.60	9.60	9.60	9.60
24	1991	FALL	1	8.00	8.0000	8.00	.	.	.	8.00	8.00	8.00	8.00	8.00
24	1991	SPRING	1	10.25	10.250	10.25	.	.	.	10.25	10.25	10.25	10.25	10.25
24	1991	SUMMER	2	7.60	7.4000	7.80	0.28	0.20	4	7.40	7.40	7.60	7.80	7.80
24	1991	WINTER	1	10.00	10.000	10.00	.	.	.	10.00	10.00	10.00	10.00	10.00
24	1992	FALL	1	8.45	8.4500	8.45	.	.	.	8.45	8.45	8.45	8.45	8.45

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subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
24	1992	SPRING	1	9.60	9.6000	9.60	.	.	.	9.60	9.60	9.60	9.60	9.60
24	1992	SUMMER	2	8.45	7.2000	9.70	1.77	1.25	21	7.20	7.20	8.45	9.70	9.70
24	1992	WINTER	2	12.40	10.550	14.25	2.62	1.85	21	10.55	10.55	12.40	14.25	14.25
24	1993	FALL	1	7.70	7.7000	7.70	.	.	.	7.70	7.70	7.70	7.70	7.70
24	1993	SPRING	1	7.50	7.5000	7.50	.	.	.	7.50	7.50	7.50	7.50	7.50
24	1993	SUMMER	2	6.65	5.2000	8.10	2.05	1.45	31	5.20	5.20	6.65	8.10	8.10
24	1993	WINTER	1	9.80	9.8000	9.80	.	.	.	9.80	9.80	9.80	9.80	9.80
24	1994	FALL	1	8.40	8.4000	8.40	.	.	.	8.40	8.40	8.40	8.40	8.40
24	1994	SPRING	2	7.03	6.1500	7.90	1.24	0.88	18	6.15	6.15	7.03	7.90	7.90
24	1994	SUMMER	2	7.45	7.0000	7.90	0.64	0.45	9	7.00	7.00	7.45	7.90	7.90
24	1994	WINTER	1	8.90	8.9000	8.90	.	.	.	8.90	8.90	8.90	8.90	8.90
24	1995	SUMMER	3	8.00	4.8000	13.40	4.70	2.72	59	4.80	4.80	5.80	13.40	13.40
24	1995	WINTER	2	8.80	8.2500	9.35	0.78	0.55	9	8.25	8.25	8.80	9.35	9.35
24	1996	SPRING	1	9.10	9.1000	9.10	.	.	.	9.10	9.10	9.10	9.10	9.10
24	1996	SUMMER	1	6.60	6.6000	6.60	.	.	.	6.60	6.60	6.60	6.60	6.60
80	1990	FALL	1	10.70	10.700	10.70	.	.	.	10.70	10.70	10.70	10.70	10.70
80	1990	SPRING	1	9.80	9.8000	9.80	.	.	.	9.80	9.80	9.80	9.80	9.80
80	1990	SUMMER	2	7.63	6.2000	9.05	2.02	1.43	26	6.20	6.20	7.63	9.05	9.05
80	1991	FALL	1	12.55	12.550	12.55	.	.	.	12.55	12.55	12.55	12.55	12.55
80	1991	SUMMER	2	8.00	7.0000	9.00	1.41	1.00	18	7.00	7.00	8.00	9.00	9.00
80	1992	FALL	1	10.75	10.750	10.75	.	.	.	10.75	10.75	10.75	10.75	10.75
80	1992	SPRING	1	10.30	10.300	10.30	.	.	.	10.30	10.30	10.30	10.30	10.30
80	1992	SUMMER	2	9.15	9.0000	9.30	0.21	0.15	2	9.00	9.00	9.15	9.30	9.30
80	1992	WINTER	1	12.50	12.500	12.50	.	.	.	12.50	12.50	12.50	12.50	12.50
80	1993	FALL	1	10.35	10.350	10.35	.	.	.	10.35	10.35	10.35	10.35	10.35
80	1993	SPRING	1	9.85	9.8500	9.85	.	.	.	9.85	9.85	9.85	9.85	9.85
80	1993	SUMMER	2	7.43	5.0500	9.80	3.36	2.38	45	5.05	5.05	7.43	9.80	9.80
80	1993	WINTER	1	11.85	11.850	11.85	.	.	.	11.85	11.85	11.85	11.85	11.85
80	1994	FALL	1	10.50	10.500	10.50	.	.	.	10.50	10.50	10.50	10.50	10.50
80	1994	SPRING	1	9.95	9.9500	9.95	.	.	.	9.95	9.95	9.95	9.95	9.95
80	1994	SUMMER	1	8.20	8.2000	8.20	.	.	.	8.20	8.20	8.20	8.20	8.20
80	1994	WINTER	1	12.00	12.000	12.00	.	.	.	12.00	12.00	12.00	12.00	12.00

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subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
80	1995	FALL	1	10.20	10.200	10.20	.	.	.	10.20	10.20	10.20	10.20	10.20
80	1995	SPRING	1	10.85	10.850	10.85	.	.	.	10.85	10.85	10.85	10.85	10.85
80	1995	SUMMER	3	7.15	5.9500	8.90	1.55	0.89	22	5.95	5.95	6.60	8.90	8.90
80	1995	WINTER	1	11.80	11.800	11.80	.	.	.	11.80	11.80	11.80	11.80	11.80
80	1996	FALL	1	9.50	9.5000	9.50	.	.	.	9.50	9.50	9.50	9.50	9.50
80	1996	SPRING	1	10.35	10.350	10.35	.	.	.	10.35	10.35	10.35	10.35	10.35
80	1996	SUMMER	2	7.43	5.7500	9.10	2.37	1.67	32	5.75	5.75	7.43	9.10	9.10
80	1996	WINTER	1	12.80	12.800	12.80	.	.	.	12.80	12.80	12.80	12.80	12.80
80	1997	FALL	1	10.30	10.300	10.30	.	.	.	10.30	10.30	10.30	10.30	10.30
80	1997	SPRING	1	9.75	9.7500	9.75	.	.	.	9.75	9.75	9.75	9.75	9.75
80	1997	SUMMER	1	9.40	9.4000	9.40	.	.	.	9.40	9.40	9.40	9.40	9.40
80	1997	WINTER	1	12.40	12.400	12.40	.	.	.	12.40	12.40	12.40	12.40	12.40
80	1998	WINTER	1	11.50	11.500	11.50	.	.	.	11.50	11.50	11.50	11.50	11.50
81	1990	FALL	1	4.70	4.7000	4.70	.	.	.	4.70	4.70	4.70	4.70	4.70
81	1991	FALL	1	6.70	6.7000	6.70	.	.	.	6.70	6.70	6.70	6.70	6.70

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Nitrite_Nitrate_NO2_NO3_mg_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
6	1990	FALL	1	0.10	.10000	0.10	.	.	.	0.10	0.10	0.10	0.10	0.10
6	1990	SPRING	1	0.03	.02500	0.03	.	.	.	0.03	0.03	0.03	0.03	0.03
6	1990	SUMMER	1	0.03	.02500	0.03	.	.	.	0.03	0.03	0.03	0.03	0.03
6	1991	FALL	1	0.01	.01000	0.01	.	.	.	0.01	0.01	0.01	0.01	0.01
6	1991	SPRING	1	0.33	.33000	0.33	.	.	.	0.33	0.33	0.33	0.33	0.33
6	1991	SUMMER	1	0.01	.01000	0.01	.	.	.	0.01	0.01	0.01	0.01	0.01
10	1990	FALL	1	0.05	.05075	0.05	.	.	.	0.05	0.05	0.05	0.05	0.05
10	1990	SPRING	2	0.01	.00150	0.03	0.02	0.01	126	0.00	0.00	0.01	0.03	0.03
10	1990	SUMMER	2	0.01	.00150	0.01	0.00	0.00	99	0.00	0.00	0.01	0.01	0.01
10	1992	FALL	1	0.01	.00575	0.01	.	.	.	0.01	0.01	0.01	0.01	0.01
10	1992	SUMMER	3	0.01	.00500	0.01	0.00	0.00	8	0.01	0.01	0.01	0.01	0.01
10	1993	FALL	1	0.02	.01750	0.02	.	.	.	0.02	0.02	0.02	0.02	0.02
10	1993	SUMMER	1	0.00	.00150	0.00	.	.	.	0.00	0.00	0.00	0.00	0.00
10	1994	FALL	4	0.10	.00800	0.20	0.08	0.04	82	0.01	0.04	0.09	0.15	0.20
10	1994	SPRING	4	0.12	.01300	0.20	0.08	0.04	69	0.01	0.06	0.13	0.18	0.20
10	1994	SUMMER	4	0.03	.00150	0.05	0.02	0.01	80	0.00	0.01	0.03	0.04	0.05
10	1994	WINTER	3	0.25	.22000	0.28	0.03	0.02	11	0.22	0.22	0.26	0.28	0.28
10	1995	FALL	4	0.04	.01950	0.08	0.03	0.01	81	0.02	0.02	0.02	0.05	0.08
10	1995	SPRING	4	0.36	.27500	0.53	0.11	0.06	31	0.28	0.29	0.32	0.43	0.53
10	1995	SUMMER	4	0.10	.10000	0.11	0.00	0.00	5	0.10	0.10	0.10	0.11	0.11
10	1995	WINTER	3	0.42	.37500	0.49	0.06	0.03	14	0.38	0.38	0.41	0.49	0.49
10	1998	FALL	5	0.19	.12500	0.25	0.06	0.02	30	0.13	0.14	0.18	0.24	0.25
10	1998	SUMMER	5	0.19	.11000	0.31	0.08	0.03	39	0.11	0.15	0.18	0.22	0.31
10	1998	WINTER	3	0.25	.16000	0.40	0.13	0.08	52	0.16	0.16	0.19	0.40	0.40
10	1999	SPRING	5	0.39	.16000	0.67	0.24	0.11	63	0.16	0.19	0.29	0.62	0.67
10	1999	WINTER	4	0.41	.19000	0.71	0.23	0.11	56	0.19	0.24	0.37	0.58	0.71
12	1991	FALL	2	1.92	1.7250	2.11	0.27	0.19	14	1.73	1.73	1.92	2.11	2.11
12	1991	SPRING	2	1.68	1.3200	2.03	0.50	0.36	30	1.32	1.32	1.68	2.03	2.03
12	1991	SUMMER	2	1.75	1.4000	2.10	0.49	0.35	28	1.40	1.40	1.75	2.10	2.10
12	1991	WINTER	2	1.75	1.5000	1.99	0.35	0.25	20	1.50	1.50	1.75	1.99	1.99
12	1992	WINTER	2	1.68	1.4700	1.90	0.30	0.21	18	1.47	1.47	1.68	1.90	1.90
13	1991	FALL	1	0.00	.00250	0.00	.	.	.	0.00	0.00	0.00	0.00	0.00

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Nitrite_Nitrate_NO2_NO3_mg_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
13	1991	SUMMER	2	0.37	.00250	0.73	0.51	0.36	140	0.00	0.00	0.37	0.73	0.73
13	1991	WINTER	1	0.01	.01000	0.01	.	.	.	0.01	0.01	0.01	0.01	0.01
13	1992	FALL	1	0.65	.64750	0.65	.	.	.	0.65	0.65	0.65	0.65	0.65
13	1992	SUMMER	6	0.05	.00050	0.24	0.10	0.04	203	0.00	0.00	0.00	0.03	0.24
13	1993	FALL	1	0.08	.08000	0.08	.	.	.	0.08	0.08	0.08	0.08	0.08
13	1993	SPRING	1	0.63	.63000	0.63	.	.	.	0.63	0.63	0.63	0.63	0.63
13	1993	SUMMER	2	0.01	.00500	0.01	0.00	0.00	0	0.01	0.01	0.01	0.01	0.01
13	1993	WINTER	1	1.79	1.7850	1.79	.	.	.	1.79	1.79	1.79	1.79	1.79
13	1994	SUMMER	1	0.17	.17000	0.17	.	.	.	0.17	0.17	0.17	0.17	0.17
13	1995	FALL	1	0.01	.00500	0.01	.	.	.	0.01	0.01	0.01	0.01	0.01
13	1996	FALL	1	0.01	.00500	0.01	.	.	.	0.01	0.01	0.01	0.01	0.01
13	1996	SUMMER	1	0.01	.00500	0.01	.	.	.	0.01	0.01	0.01	0.01	0.01
18	1991	SUMMER	1	0.05	.05000	0.05	.	.	.	0.05	0.05	0.05	0.05	0.05
20	1991	FALL	5	0.08	.00250	0.34	0.15	0.07	175	0.00	0.00	0.00	0.07	0.34
20	1992	FALL	2	0.05	.05000	0.05	0.00	0.00	0	0.05	0.05	0.05	0.05	0.05
20	1992	SPRING	1	0.01	.00700	0.01	.	.	.	0.01	0.01	0.01	0.01	0.01
20	1995	FALL	1	0.10	.10000	0.10	.	.	.	0.10	0.10	0.10	0.10	0.10
20	1995	SUMMER	2	0.01	.00500	0.01	0.00	0.00	0	0.01	0.01	0.01	0.01	0.01
20	1996	FALL	1	0.01	.00500	0.01	.	.	.	0.01	0.01	0.01	0.01	0.01
20	1996	SPRING	1	0.01	.00500	0.01	.	.	.	0.01	0.01	0.01	0.01	0.01
20	1996	SUMMER	2	0.01	.00500	0.01	0.00	0.00	0	0.01	0.01	0.01	0.01	0.01
20	1996	WINTER	2	0.14	.13000	0.14	0.01	0.01	5	0.13	0.13	0.14	0.14	0.14
20	1999	SUMMER	2	0.06	.00000	0.12	0.08	0.06	141	0.00	0.00	0.06	0.12	0.12
22	1990	FALL	1	0.13	.13000	0.13	.	.	.	0.13	0.13	0.13	0.13	0.13
22	1990	SPRING	1	0.28	.27500	0.28	.	.	.	0.28	0.28	0.28	0.28	0.28
22	1990	SUMMER	2	0.19	.02500	0.36	0.24	0.17	123	0.03	0.03	0.19	0.36	0.36
22	1991	FALL	2	0.06	.05000	0.08	0.02	0.01	28	0.05	0.05	0.06	0.08	0.08
22	1991	SPRING	3	0.08	.01000	0.20	0.11	0.06	135	0.01	0.01	0.03	0.20	0.20
22	1991	SUMMER	3	0.06	.03500	0.09	0.03	0.02	55	0.04	0.04	0.04	0.09	0.09
22	1992	FALL	2	0.11	.11000	0.11	0.00	0.00	0	0.11	0.11	0.11	0.11	0.11
22	1992	SPRING	1	0.01	.01000	0.01	.	.	.	0.01	0.01	0.01	0.01	0.01
22	1992	SUMMER	2	0.09	.01000	0.17	0.11	0.08	126	0.01	0.01	0.09	0.17	0.17

Aggregate Nutrient Ecoregion: III
Lakes and Reservoirs
Descriptive Statistics by Subecoregion, Year and Season
from 1990 to 1999
Nitrite_Nitrate_NO2_NO3_mg_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
22	1993	SPRING	3	0.04	.01000	0.06	0.03	0.02	67	0.01	0.01	0.06	0.06	0.06
22	1993	SUMMER	5	0.07	.01000	0.21	0.08	0.04	116	0.01	0.01	0.04	0.09	0.21
22	1993	WINTER	2	0.17	.14000	0.20	0.04	0.03	25	0.14	0.14	0.17	0.20	0.20
22	1995	FALL	2	0.03	.02500	0.03	0.00	0.00	0	0.03	0.03	0.03	0.03	0.03
22	1995	SPRING	1	0.03	.02500	0.03	.	.	.	0.03	0.03	0.03	0.03	0.03
22	1995	SUMMER	1	0.03	.02500	0.03	.	.	.	0.03	0.03	0.03	0.03	0.03
22	1999	SUMMER	2	0.00	.00000	0.00	0.00	0.00	.	0.00	0.00	0.00	0.00	0.00
24	1990	FALL	2	0.04	.01000	0.06	0.04	0.03	101	0.01	0.01	0.04	0.06	0.06
24	1990	SPRING	2	0.04	.01000	0.07	0.04	0.03	106	0.01	0.01	0.04	0.07	0.07
24	1990	SUMMER	2	0.10	.09500	0.10	0.00	0.00	4	0.10	0.10	0.10	0.10	0.10
24	1992	SPRING	5	1.58	.01000	2.89	1.26	0.57	80	0.01	0.56	1.79	2.64	2.89
24	1992	SUMMER	2	0.01	.01000	0.01	0.00	0.00	0	0.01	0.01	0.01	0.01	0.01
24	1992	WINTER	4	0.02	.01000	0.04	0.01	0.01	77	0.01	0.01	0.01	0.02	0.04
24	1993	SPRING	8	0.47	.01000	3.68	1.30	0.46	276	0.01	0.01	0.01	0.02	3.68
24	1995	SUMMER	4	0.86	.01000	3.20	1.56	0.78	182	0.01	0.02	0.11	1.70	3.20
24	1995	WINTER	1	1.31	1.3050	1.31	.	.	.	1.31	1.31	1.31	1.31	1.31
24	1996	SPRING	1	0.67	.67000	0.67	.	.	.	0.67	0.67	0.67	0.67	0.67
24	1996	SUMMER	1	0.09	.08625	0.09	.	.	.	0.09	0.09	0.09	0.09	0.09
24	1997	FALL	1	0.03	.02500	0.03	.	.	.	0.03	0.03	0.03	0.03	0.03
24	1997	SPRING	1	0.06	.06250	0.06	.	.	.	0.06	0.06	0.06	0.06	0.06
24	1997	SUMMER	1	0.03	.02500	0.03	.	.	.	0.03	0.03	0.03	0.03	0.03
80	1990	FALL	1	0.02	.02000	0.02	.	.	.	0.02	0.02	0.02	0.02	0.02
80	1990	SPRING	1	0.02	.02000	0.02	.	.	.	0.02	0.02	0.02	0.02	0.02
80	1990	SUMMER	1	0.01	.01250	0.01	.	.	.	0.01	0.01	0.01	0.01	0.01
80	1991	SUMMER	2	0.00	.00100	0.01	0.00	0.00	94	0.00	0.00	0.00	0.01	0.01
80	1992	FALL	1	0.01	.00500	0.01	.	.	.	0.01	0.01	0.01	0.01	0.01
80	1992	SPRING	1	0.03	.03000	0.03	.	.	.	0.03	0.03	0.03	0.03	0.03
80	1992	SUMMER	2	0.01	.00500	0.01	0.00	0.00	0	0.01	0.01	0.01	0.01	0.01
80	1992	WINTER	1	0.01	.00500	0.01	.	.	.	0.01	0.01	0.01	0.01	0.01
80	1993	FALL	1	0.01	.00500	0.01	.	.	.	0.01	0.01	0.01	0.01	0.01
80	1993	SPRING	1	0.08	.07500	0.08	.	.	.	0.08	0.08	0.08	0.08	0.08
80	1993	SUMMER	1	0.04	.04000	0.04	.	.	.	0.04	0.04	0.04	0.04	0.04

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
80	1993	WINTER	1	0.06	.05500	0.06	.	.	.	0.06	0.06	0.06	0.06	0.06
80	1994	FALL	1	0.01	.00500	0.01	.	.	.	0.01	0.01	0.01	0.01	0.01
80	1994	SPRING	1	0.01	.01250	0.01	.	.	.	0.01	0.01	0.01	0.01	0.01
80	1994	SUMMER	1	0.02	.02000	0.02	.	.	.	0.02	0.02	0.02	0.02	0.02
80	1994	WINTER	1	0.02	.02000	0.02	.	.	.	0.02	0.02	0.02	0.02	0.02
80	1995	FALL	1	0.01	.00500	0.01	.	.	.	0.01	0.01	0.01	0.01	0.01
80	1995	SPRING	1	0.02	.01750	0.02	.	.	.	0.02	0.02	0.02	0.02	0.02
80	1995	SUMMER	1	0.01	.00500	0.01	.	.	.	0.01	0.01	0.01	0.01	0.01
80	1995	WINTER	1	0.04	.04000	0.04	.	.	.	0.04	0.04	0.04	0.04	0.04
80	1996	FALL	1	0.02	.02000	0.02	.	.	.	0.02	0.02	0.02	0.02	0.02
80	1996	SPRING	1	0.02	.02000	0.02	.	.	.	0.02	0.02	0.02	0.02	0.02
80	1996	SUMMER	1	0.01	.00500	0.01	.	.	.	0.01	0.01	0.01	0.01	0.01
80	1996	WINTER	1	0.03	.03000	0.03	.	.	.	0.03	0.03	0.03	0.03	0.03
80	1997	FALL	1	0.02	.02000	0.02	.	.	.	0.02	0.02	0.02	0.02	0.02
80	1997	SPRING	1	0.01	.01250	0.01	.	.	.	0.01	0.01	0.01	0.01	0.01
80	1997	SUMMER	1	0.02	.02000	0.02	.	.	.	0.02	0.02	0.02	0.02	0.02
80	1997	WINTER	1	0.03	.03000	0.03	.	.	.	0.03	0.03	0.03	0.03	0.03
80	1998	WINTER	1	0.04	.04000	0.04	.	.	.	0.04	0.04	0.04	0.04	0.04
81	1990	FALL	1	0.03	.02500	0.03	.	.	.	0.03	0.03	0.03	0.03	0.03
81	1991	FALL	1	0.01	.01000	0.01	.	.	.	0.01	0.01	0.01	0.01	0.01

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from 1990 to 1999
Nitrogen_Tot_Kjeldhal_mg_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
6	1990	FALL	1	0.40	.40000	0.40	.	.	.	0.40	0.40	0.40	0.40	0.40
6	1990	SPRING	4	0.40	.20000	0.60	0.23	0.12	58	0.20	0.20	0.40	0.60	0.60
6	1990	SUMMER	1	0.50	.50000	0.50	.	.	.	0.50	0.50	0.50	0.50	0.50
6	1990	WINTER	1	1.80	1.8000	1.80	.	.	.	1.80	1.80	1.80	1.80	1.80
6	1991	FALL	1	0.50	.50000	0.50	.	.	.	0.50	0.50	0.50	0.50	0.50
6	1991	SPRING	1	0.60	.60000	0.60	.	.	.	0.60	0.60	0.60	0.60	0.60
6	1991	SUMMER	1	0.40	.40000	0.40	.	.	.	0.40	0.40	0.40	0.40	0.40
6	1994	WINTER	1	2.10	2.1000	2.10	.	.	.	2.10	2.10	2.10	2.10	2.10
10	1990	FALL	3	0.87	.42000	1.28	0.43	0.25	50	0.42	0.42	0.91	1.28	1.28
10	1990	SPRING	4	0.76	.25000	1.15	0.38	0.19	50	0.25	0.49	0.83	1.04	1.15
10	1990	SUMMER	4	1.06	.47000	1.68	0.53	0.26	50	0.47	0.64	1.05	1.48	1.68
10	1991	FALL	1	0.38	.38000	0.38	.	.	.	0.38	0.38	0.38	0.38	0.38
10	1991	SPRING	2	0.87	.86000	0.87	0.01	0.01	1	0.86	0.86	0.87	0.87	0.87
10	1991	SUMMER	2	1.03	.76000	1.30	0.38	0.27	37	0.76	0.76	1.03	1.30	1.30
10	1991	WINTER	2	0.82	.48000	1.16	0.48	0.34	59	0.48	0.48	0.82	1.16	1.16
10	1992	FALL	3	1.26	.37000	2.63	1.20	0.70	96	0.37	0.37	0.78	2.63	2.63
10	1992	SPRING	2	0.75	.61500	0.88	0.18	0.13	25	0.62	0.62	0.75	0.88	0.88
10	1992	SUMMER	5	1.41	.50000	3.68	1.33	0.60	95	0.50	0.62	0.70	1.54	3.68
10	1992	WINTER	2	0.57	.56000	0.57	0.01	0.01	1	0.56	0.56	0.57	0.57	0.57
10	1993	FALL	3	0.76	.40000	1.34	0.51	0.29	67	0.40	0.40	0.53	1.34	1.34
10	1993	SPRING	2	0.63	.58000	0.67	0.06	0.05	10	0.58	0.58	0.63	0.67	0.67
10	1993	SUMMER	6	0.69	.25000	1.01	0.31	0.13	46	0.25	0.44	0.71	1.00	1.01
10	1993	WINTER	2	0.58	.43000	0.72	0.21	0.15	36	0.43	0.43	0.58	0.72	0.72
10	1994	FALL	3	1.37	.29000	3.27	1.65	0.95	120	0.29	0.29	0.56	3.27	3.27
10	1994	SPRING	3	0.78	.40000	1.33	0.48	0.28	62	0.40	0.40	0.63	1.33	1.33
10	1994	SUMMER	3	1.19	.33000	1.97	0.82	0.47	69	0.33	0.33	1.26	1.97	1.97
10	1994	WINTER	2	0.49	.44000	0.54	0.07	0.05	14	0.44	0.44	0.49	0.54	0.54
10	1995	FALL	3	0.46	.22000	0.72	0.25	0.14	54	0.22	0.22	0.45	0.72	0.72
10	1995	SPRING	3	0.79	.43500	1.11	0.34	0.20	43	0.44	0.44	0.83	1.11	1.11
10	1995	SUMMER	3	0.72	.41000	1.09	0.34	0.20	48	0.41	0.41	0.65	1.09	1.09
10	1995	WINTER	2	0.47	.35000	0.58	0.16	0.11	35	0.35	0.35	0.47	0.58	0.58
10	1996	FALL	2	0.53	.42000	0.64	0.16	0.11	29	0.42	0.42	0.53	0.64	0.64

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Lakes and Reservoirs
Descriptive Statistics by Subecoregion, Year and Season
from 1990 to 1999
Nitrogen_Tot_Kjeldhal_mg_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
10	1996	SPRING	2	0.52	.50500	0.54	0.02	0.02	4	0.51	0.51	0.52	0.54	0.54
10	1996	SUMMER	4	0.43	.16000	0.73	0.28	0.14	65	0.16	0.19	0.41	0.66	0.73
10	1996	WINTER	2	0.39	.32000	0.46	0.10	0.07	25	0.32	0.32	0.39	0.46	0.46
10	1997	FALL	2	0.60	.47000	0.73	0.18	0.13	31	0.47	0.47	0.60	0.73	0.73
10	1997	SPRING	2	0.63	.55500	0.70	0.10	0.07	16	0.56	0.56	0.63	0.70	0.70
10	1997	SUMMER	3	0.61	.51000	0.81	0.17	0.10	28	0.51	0.51	0.52	0.81	0.81
10	1997	WINTER	2	0.37	.34000	0.40	0.04	0.03	11	0.34	0.34	0.37	0.40	0.40
10	1998	FALL	5	0.86	.67500	1.24	0.24	0.11	28	0.68	0.70	0.73	0.96	1.24
10	1998	SPRING	2	0.50	.37000	0.63	0.18	0.13	37	0.37	0.37	0.50	0.63	0.63
10	1998	SUMMER	7	0.88	.48000	1.32	0.29	0.11	33	0.48	0.58	0.94	1.10	1.32
10	1998	WINTER	3	0.57	.50000	0.64	0.07	0.04	12	0.50	0.50	0.56	0.64	0.64
10	1999	SPRING	5	0.70	.62500	0.84	0.09	0.04	12	0.63	0.63	0.69	0.70	0.84
10	1999	WINTER	4	0.84	.45000	1.16	0.30	0.15	36	0.45	0.63	0.87	1.05	1.16
12	1990	SUMMER	5	0.59	.12000	1.63	0.60	0.27	102	0.12	0.27	0.45	0.49	1.63
12	1991	FALL	2	0.26	.00000	0.52	0.37	0.26	141	0.00	0.00	0.26	0.52	0.52
12	1991	SPRING	2	0.28	.00000	0.56	0.40	0.28	141	0.00	0.00	0.28	0.56	0.56
12	1991	SUMMER	6	0.31	.00000	0.42	0.16	0.06	50	0.00	0.32	0.37	0.41	0.42
12	1991	WINTER	2	0.27	.00000	0.54	0.38	0.27	141	0.00	0.00	0.27	0.54	0.54
12	1992	SUMMER	3	0.37	.33000	0.40	0.04	0.02	10	0.33	0.33	0.37	0.40	0.40
12	1992	WINTER	2	0.39	.00000	0.77	0.54	0.39	141	0.00	0.00	0.39	0.77	0.77
12	1993	SUMMER	2	0.14	.11000	0.17	0.04	0.03	28	0.11	0.11	0.14	0.17	0.17
12	1994	SUMMER	4	0.37	.31500	0.45	0.06	0.03	15	0.32	0.33	0.35	0.40	0.45
12	1995	SUMMER	3	0.30	.28000	0.33	0.03	0.01	8	0.28	0.28	0.30	0.33	0.33
12	1996	SUMMER	5	0.17	.12000	0.24	0.05	0.02	28	0.12	0.13	0.17	0.20	0.24
12	1997	SUMMER	5	0.42	.32000	0.52	0.09	0.04	22	0.32	0.37	0.38	0.52	0.52
13	1990	FALL	2	0.62	.30000	0.93	0.45	0.32	72	0.30	0.30	0.62	0.93	0.93
13	1990	SPRING	7	0.37	.20000	0.75	0.19	0.07	50	0.20	0.20	0.36	0.40	0.75
13	1990	SUMMER	25	0.67	.10000	2.28	0.49	0.10	74	0.20	0.40	0.56	0.80	1.90
13	1990	WINTER	1	0.33	.33000	0.33	.	.	.	0.33	0.33	0.33	0.33	0.33
13	1991	FALL	2	0.52	.43500	0.61	0.12	0.09	23	0.44	0.44	0.52	0.61	0.61
13	1991	SPRING	9	0.69	.10000	2.90	0.87	0.29	126	0.10	0.20	0.48	0.75	2.90
13	1991	SUMMER	7	1.01	.19000	3.19	1.00	0.38	99	0.19	0.33	0.78	0.93	3.19

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from 1990 to 1999
Nitrogen_Tot_Kjeldhal_mg_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
13	1991	WINTER	4	1.04	.57000	1.40	0.38	0.19	37	0.57	0.74	1.10	1.35	1.40
13	1992	FALL	14	0.68	.07250	2.18	0.56	0.15	83	0.07	0.27	0.52	0.93	2.18
13	1992	SPRING	18	0.43	.02500	2.63	0.58	0.14	133	0.03	0.18	0.29	0.50	2.63
13	1992	SUMMER	13	0.45	.07000	1.59	0.38	0.11	84	0.07	0.24	0.41	0.51	1.59
13	1992	WINTER	3	1.33	.34000	2.93	1.40	0.81	106	0.34	0.34	0.71	2.93	2.93
13	1993	FALL	2	1.96	1.8500	2.08	0.16	0.11	8	1.85	1.85	1.96	2.08	2.08
13	1993	SPRING	2	1.87	.82500	2.91	1.47	1.04	79	0.83	0.83	1.87	2.91	2.91
13	1993	SUMMER	2	1.67	.89000	2.45	1.10	0.78	66	0.89	0.89	1.67	2.45	2.45
13	1993	WINTER	1	2.28	2.2800	2.28	.	.	.	2.28	2.28	2.28	2.28	2.28
13	1994	FALL	3	1.34	.57000	2.72	1.20	0.69	90	0.57	0.57	0.72	2.72	2.72
13	1994	SPRING	3	1.23	.45500	2.66	1.24	0.71	101	0.46	0.46	0.57	2.66	2.66
13	1994	SUMMER	5	1.32	.57000	3.05	0.99	0.44	75	0.57	0.90	0.95	1.16	3.05
13	1994	WINTER	3	1.56	.33000	2.31	1.07	0.62	69	0.33	0.33	2.03	2.31	2.31
13	1995	FALL	2	2.08	1.2600	2.90	1.16	0.82	56	1.26	1.26	2.08	2.90	2.90
13	1995	SPRING	4	1.10	.26000	2.64	1.07	0.53	97	0.26	0.40	0.75	1.80	2.64
13	1995	SUMMER	2	1.73	.89000	2.56	1.18	0.84	68	0.89	0.89	1.73	2.56	2.56
13	1995	WINTER	3	1.27	.34000	2.76	1.30	0.75	102	0.34	0.34	0.72	2.76	2.76
13	1996	FALL	4	1.11	.57500	2.27	0.78	0.39	70	0.58	0.63	0.81	1.60	2.27
13	1996	SPRING	3	1.09	.36000	2.53	1.24	0.72	114	0.36	0.36	0.38	2.53	2.53
13	1996	SUMMER	4	1.13	.19000	2.91	1.25	0.62	111	0.19	0.27	0.70	1.98	2.91
13	1996	WINTER	3	1.40	.48000	2.91	1.32	0.76	95	0.48	0.48	0.80	2.91	2.91
13	1997	FALL	7	0.64	.14000	1.40	0.43	0.16	67	0.14	0.30	0.60	0.99	1.40
13	1997	SPRING	3	1.31	.53000	2.43	0.99	0.57	76	0.53	0.53	0.97	2.43	2.43
13	1997	SUMMER	7	0.75	.22000	1.42	0.39	0.15	53	0.22	0.45	0.68	0.99	1.42
13	1997	WINTER	2	0.50	.34000	0.65	0.22	0.16	44	0.34	0.34	0.50	0.65	0.65
13	1998	SPRING	4	1.35	.59000	3.19	1.24	0.62	92	0.59	0.64	0.81	2.06	3.19
13	1998	WINTER	3	0.50	.29000	0.70	0.21	0.12	41	0.29	0.29	0.52	0.70	0.70
18	1991	SUMMER	3	0.54	.33000	0.70	0.19	0.11	35	0.33	0.33	0.60	0.70	0.70
18	1992	SPRING	1	0.38	.38000	0.38	.	.	.	0.38	0.38	0.38	0.38	0.38
18	1995	FALL	2	0.30	.30000	0.30	0.00	0.00	0	0.30	0.30	0.30	0.30	0.30
18	1995	SUMMER	2	0.35	.30000	0.40	0.07	0.05	20	0.30	0.30	0.35	0.40	0.40
18	1996	FALL	2	0.30	.30000	0.30	0.00	0.00	0	0.30	0.30	0.30	0.30	0.30

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subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
18	1996	SUMMER	1	0.35	.35000	0.35	.	.	.	0.35	0.35	0.35	0.35	0.35
20	1990	FALL	1	0.60	.60000	0.60	.	.	.	0.60	0.60	0.60	0.60	0.60
20	1990	SPRING	6	0.34	.02500	0.80	0.30	0.12	88	0.03	0.15	0.23	0.60	0.80
20	1990	SUMMER	13	0.39	.06250	0.85	0.28	0.08	73	0.06	0.20	0.30	0.70	0.85
20	1991	FALL	6	0.50	.02500	1.22	0.46	0.19	93	0.03	0.22	0.31	0.90	1.22
20	1991	SPRING	10	0.17	.02500	0.60	0.18	0.06	111	0.03	0.03	0.10	0.25	0.60
20	1991	SUMMER	14	0.24	.02500	0.56	0.16	0.04	67	0.03	0.10	0.23	0.35	0.56
20	1991	WINTER	1	0.70	.70000	0.70	.	.	.	0.70	0.70	0.70	0.70	0.70
20	1992	FALL	8	0.68	.26500	1.18	0.32	0.11	48	0.27	0.45	0.61	0.92	1.18
20	1992	SPRING	12	0.27	.02500	0.93	0.28	0.08	104	0.03	0.03	0.22	0.37	0.93
20	1992	SUMMER	6	0.27	.17000	0.42	0.10	0.04	36	0.17	0.19	0.26	0.35	0.42
20	1992	WINTER	1	0.06	.06250	0.06	.	.	.	0.06	0.06	0.06	0.06	0.06
20	1993	FALL	3	0.52	.30000	0.71	0.21	0.12	40	0.30	0.30	0.56	0.71	0.71
20	1993	SPRING	3	0.29	.15500	0.43	0.14	0.08	48	0.16	0.16	0.27	0.43	0.43
20	1993	SUMMER	1	0.40	.40000	0.40	.	.	.	0.40	0.40	0.40	0.40	0.40
20	1994	FALL	2	0.25	.14000	0.35	0.15	0.11	61	0.14	0.14	0.25	0.35	0.35
20	1994	SPRING	1	0.10	.10000	0.10	.	.	.	0.10	0.10	0.10	0.10	0.10
20	1994	SUMMER	2	0.19	.18500	0.20	0.01	0.01	6	0.19	0.19	0.19	0.20	0.20
20	1994	WINTER	2	0.28	.10000	0.45	0.25	0.18	90	0.10	0.10	0.28	0.45	0.45
20	1995	FALL	2	2.21	.79000	3.63	2.01	1.42	91	0.79	0.79	2.21	3.63	3.63
20	1995	SPRING	4	0.65	.02500	1.62	0.69	0.34	106	0.03	0.20	0.47	1.09	1.62
20	1995	SUMMER	4	0.75	.02500	2.02	0.88	0.44	119	0.03	0.16	0.47	1.33	2.02
20	1995	WINTER	2	0.28	.18000	0.38	0.14	0.10	50	0.18	0.18	0.28	0.38	0.38
20	1996	FALL	2	1.43	.58500	2.28	1.20	0.85	84	0.59	0.59	1.43	2.28	2.28
20	1996	SPRING	2	2.03	.87000	3.19	1.64	1.16	81	0.87	0.87	2.03	3.19	3.19
20	1996	SUMMER	2	2.22	.78000	3.65	2.03	1.44	92	0.78	0.78	2.22	3.65	3.65
20	1997	SPRING	1	5.26	5.2600	5.26	.	.	.	5.26	5.26	5.26	5.26	5.26
22	1990	FALL	1	0.20	.20000	0.20	.	.	.	0.20	0.20	0.20	0.20	0.20
22	1990	SPRING	1	1.68	1.6800	1.68	.	.	.	1.68	1.68	1.68	1.68	1.68
22	1990	SUMMER	2	0.78	.66000	0.90	0.17	0.12	22	0.66	0.66	0.78	0.90	0.90
22	1991	FALL	2	0.70	.38500	1.02	0.45	0.32	64	0.39	0.39	0.70	1.02	1.02
22	1991	SPRING	3	0.53	.02500	1.47	0.81	0.47	155	0.03	0.03	0.09	1.47	1.47

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subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
22	1991	SUMMER	3	0.61	.02500	1.19	0.58	0.34	96	0.03	0.03	0.60	1.19	1.19
22	1992	FALL	2	0.19	.18000	0.19	0.01	0.01	4	0.18	0.18	0.19	0.19	0.19
22	1992	SPRING	1	0.43	.43000	0.43	.	.	.	0.43	0.43	0.43	0.43	0.43
22	1992	SUMMER	4	0.51	.02500	1.00	0.47	0.24	92	0.03	0.11	0.52	0.92	1.00
22	1993	SPRING	3	0.29	.17000	0.38	0.11	0.06	37	0.17	0.17	0.31	0.38	0.38
22	1993	SUMMER	7	0.71	.25000	2.20	0.69	0.26	97	0.25	0.28	0.40	0.90	2.20
22	1993	WINTER	2	0.22	.22000	0.22	0.00	0.00	0	0.22	0.22	0.22	0.22	0.22
22	1994	SUMMER	1	0.20	.20000	0.20	.	.	.	0.20	0.20	0.20	0.20	0.20
22	1995	FALL	2	0.65	.40000	0.90	0.35	0.25	54	0.40	0.40	0.65	0.90	0.90
22	1995	SPRING	1	0.43	.43000	0.43	.	.	.	0.43	0.43	0.43	0.43	0.43
22	1995	SUMMER	1	0.50	.50000	0.50	.	.	.	0.50	0.50	0.50	0.50	0.50
22	1996	SPRING	1	0.60	.60000	0.60	.	.	.	0.60	0.60	0.60	0.60	0.60
24	1990	FALL	3	0.77	.40000	1.40	0.55	0.32	72	0.40	0.40	0.50	1.40	1.40
24	1990	SPRING	2	0.57	.55000	0.58	0.02	0.02	4	0.55	0.55	0.57	0.58	0.58
24	1990	SUMMER	2	0.90	.89000	0.91	0.01	0.01	1	0.89	0.89	0.90	0.91	0.91
24	1991	SUMMER	1	1.80	1.8000	1.80	.	.	.	1.80	1.80	1.80	1.80	1.80
24	1992	SPRING	2	2.09	1.6300	2.54	0.64	0.46	31	1.63	1.63	2.09	2.54	2.54
24	1992	SUMMER	3	0.42	.30000	0.57	0.14	0.08	33	0.30	0.30	0.38	0.57	0.57
24	1992	WINTER	4	0.33	.29000	0.36	0.03	0.01	9	0.29	0.32	0.34	0.35	0.36
24	1993	FALL	1	0.23	.22500	0.23	.	.	.	0.23	0.23	0.23	0.23	0.23
24	1993	SPRING	7	1.36	.41000	3.51	1.09	0.41	80	0.41	0.53	0.85	1.86	3.51
24	1993	SUMMER	2	0.63	.24000	1.03	0.56	0.39	88	0.24	0.24	0.63	1.03	1.03
24	1993	WINTER	1	0.49	.49000	0.49	.	.	.	0.49	0.49	0.49	0.49	0.49
24	1994	SPRING	1	1.40	1.4000	1.40	.	.	.	1.40	1.40	1.40	1.40	1.40
24	1995	SUMMER	4	0.87	.50000	1.20	0.37	0.19	43	0.50	0.55	0.89	1.19	1.20
24	1995	WINTER	1	0.98	.98000	0.98	.	.	.	0.98	0.98	0.98	0.98	0.98
24	1996	SPRING	1	0.89	.88500	0.89	.	.	.	0.89	0.89	0.89	0.89	0.89
24	1996	SUMMER	1	1.20	1.1950	1.20	.	.	.	1.20	1.20	1.20	1.20	1.20
24	1997	FALL	1	0.40	.39500	0.40	.	.	.	0.40	0.40	0.40	0.40	0.40
24	1997	SPRING	1	0.35	.35000	0.35	.	.	.	0.35	0.35	0.35	0.35	0.35
24	1997	SUMMER	1	0.57	.56500	0.57	.	.	.	0.57	0.57	0.57	0.57	0.57
80	1990	FALL	1	0.05	.05000	0.05	.	.	.	0.05	0.05	0.05	0.05	0.05

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subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
80	1990	SPRING	1	0.40	.40000	0.40	.	.	.	0.40	0.40	0.40	0.40	0.40
80	1990	SUMMER	2	0.44	.25000	0.63	0.27	0.19	61	0.25	0.25	0.44	0.63	0.63
80	1991	FALL	1	0.05	.05000	0.05	.	.	.	0.05	0.05	0.05	0.05	0.05
80	1991	SUMMER	1	0.40	.40000	0.40	.	.	.	0.40	0.40	0.40	0.40	0.40
80	1992	FALL	1	0.20	.20000	0.20	.	.	.	0.20	0.20	0.20	0.20	0.20
80	1992	SPRING	1	0.20	.20000	0.20	.	.	.	0.20	0.20	0.20	0.20	0.20
80	1992	SUMMER	2	0.30	.20000	0.40	0.14	0.10	47	0.20	0.20	0.30	0.40	0.40
80	1992	WINTER	1	0.30	.30000	0.30	.	.	.	0.30	0.30	0.30	0.30	0.30
80	1993	FALL	1	0.18	.17500	0.18	.	.	.	0.18	0.18	0.18	0.18	0.18
80	1993	SPRING	1	0.45	.45000	0.45	.	.	.	0.45	0.45	0.45	0.45	0.45
80	1993	SUMMER	2	0.28	.25500	0.30	0.03	0.02	11	0.26	0.26	0.28	0.30	0.30
80	1993	WINTER	1	0.20	.20000	0.20	.	.	.	0.20	0.20	0.20	0.20	0.20
80	1994	FALL	1	0.23	.22500	0.23	.	.	.	0.23	0.23	0.23	0.23	0.23
80	1994	SPRING	1	0.35	.35000	0.35	.	.	.	0.35	0.35	0.35	0.35	0.35
80	1994	SUMMER	1	0.30	.30000	0.30	.	.	.	0.30	0.30	0.30	0.30	0.30
80	1994	WINTER	1	0.05	.05000	0.05	.	.	.	0.05	0.05	0.05	0.05	0.05
80	1995	FALL	1	0.25	.25000	0.25	.	.	.	0.25	0.25	0.25	0.25	0.25
80	1995	SPRING	1	0.20	.20000	0.20	.	.	.	0.20	0.20	0.20	0.20	0.20
80	1995	SUMMER	3	0.41	.22000	0.70	0.26	0.15	63	0.22	0.22	0.30	0.70	0.70
80	1995	WINTER	1	0.05	.05000	0.05	.	.	.	0.05	0.05	0.05	0.05	0.05
80	1996	FALL	1	0.05	.05000	0.05	.	.	.	0.05	0.05	0.05	0.05	0.05
80	1996	SPRING	1	0.20	.20000	0.20	.	.	.	0.20	0.20	0.20	0.20	0.20
80	1996	SUMMER	2	0.37	.20000	0.54	0.24	0.17	65	0.20	0.20	0.37	0.54	0.54
80	1996	WINTER	1	0.05	.05000	0.05	.	.	.	0.05	0.05	0.05	0.05	0.05
80	1997	FALL	1	0.05	.05000	0.05	.	.	.	0.05	0.05	0.05	0.05	0.05
80	1997	SPRING	1	0.20	.20000	0.20	.	.	.	0.20	0.20	0.20	0.20	0.20
80	1997	SUMMER	1	0.20	.20000	0.20	.	.	.	0.20	0.20	0.20	0.20	0.20
80	1997	WINTER	1	0.20	.20000	0.20	.	.	.	0.20	0.20	0.20	0.20	0.20
80	1998	WINTER	1	0.05	.05000	0.05	.	.	.	0.05	0.05	0.05	0.05	0.05
81	1990	FALL	1	0.60	.60000	0.60	.	.	.	0.60	0.60	0.60	0.60	0.60
81	1991	FALL	1	0.40	.40000	0.40	.	.	.	0.40	0.40	0.40	0.40	0.40

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subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
6	1990	FALL	1	2.00	2.0000	2.00	.	.	.	2.00	2.00	2.00	2.00	2.00
6	1990	SPRING	1	1.10	1.1000	1.10	.	.	.	1.10	1.10	1.10	1.10	1.10
6	1990	SUMMER	1	1.32	1.3200	1.32	.	.	.	1.32	1.32	1.32	1.32	1.32
6	1991	SPRING	1	1.06	1.0550	1.06	.	.	.	1.06	1.06	1.06	1.06	1.06
6	1991	SUMMER	1	1.51	1.5100	1.51	.	.	.	1.51	1.51	1.51	1.51	1.51
6	1993	FALL	1	1.34	1.3350	1.34	.	.	.	1.34	1.34	1.34	1.34	1.34
6	1994	FALL	1	0.48	.48000	0.48	.	.	.	0.48	0.48	0.48	0.48	0.48
6	1994	SPRING	1	1.86	1.8550	1.86	.	.	.	1.86	1.86	1.86	1.86	1.86
6	1994	SUMMER	1	0.43	.43000	0.43	.	.	.	0.43	0.43	0.43	0.43	0.43
6	1997	FALL	1	0.75	.75000	0.75	.	.	.	0.75	0.75	0.75	0.75	0.75
6	1997	SUMMER	1	1.45	1.4500	1.45	.	.	.	1.45	1.45	1.45	1.45	1.45
10	1992	FALL	1	1.50	1.5000	1.50	.	.	.	1.50	1.50	1.50	1.50	1.50
10	1993	FALL	1	3.10	3.1000	3.10	.	.	.	3.10	3.10	3.10	3.10	3.10
10	1993	SUMMER	3	1.33	.00000	2.20	1.17	0.68	88	0.00	0.00	1.80	2.20	2.20
10	1994	FALL	4	1.69	.60000	2.35	0.76	0.38	45	0.60	1.20	1.90	2.18	2.35
10	1994	SPRING	4	1.96	1.3500	3.70	1.16	0.58	59	1.35	1.38	1.40	2.55	3.70
10	1994	SUMMER	4	1.53	1.2000	1.80	0.25	0.13	16	1.20	1.35	1.55	1.70	1.80
10	1994	WINTER	3	3.13	2.7000	3.50	0.40	0.23	13	2.70	2.70	3.20	3.50	3.50
10	1995	FALL	4	2.08	1.2500	3.55	1.01	0.51	49	1.25	1.48	1.75	2.68	3.55
10	1995	SPRING	4	1.08	.90000	1.40	0.24	0.12	22	0.90	0.90	1.00	1.25	1.40
10	1995	SUMMER	4	1.40	1.2000	1.80	0.28	0.14	20	1.20	1.20	1.30	1.60	1.80
10	1995	WINTER	3	1.48	.50000	2.05	0.85	0.49	58	0.50	0.50	1.90	2.05	2.05
10	1996	SUMMER	1	0.60	.60000	0.60	.	.	.	0.60	0.60	0.60	0.60	0.60
10	1997	SUMMER	1	0.20	.20000	0.20	.	.	.	0.20	0.20	0.20	0.20	0.20
10	1998	SUMMER	1	2.50	2.5000	2.50	.	.	.	2.50	2.50	2.50	2.50	2.50
12	1990	SUMMER	4	2.63	.50000	7.00	2.96	1.48	113	0.50	0.85	1.50	4.40	7.00
12	1991	SUMMER	3	2.20	1.5000	2.60	0.61	0.35	28	1.50	1.50	2.50	2.60	2.60
12	1992	SUMMER	2	1.03	.80000	1.25	0.32	0.23	31	0.80	0.80	1.03	1.25	1.25
12	1993	SUMMER	2	3.10	1.6000	4.60	2.12	1.50	68	1.60	1.60	3.10	4.60	4.60
12	1994	SUMMER	3	1.55	1.4000	1.80	0.22	0.13	14	1.40	1.40	1.45	1.80	1.80
12	1995	SUMMER	2	2.15	1.2000	3.10	1.34	0.95	62	1.20	1.20	2.15	3.10	3.10
12	1996	SUMMER	4	2.80	2.7000	3.00	0.14	0.07	5	2.70	2.70	2.75	2.90	3.00

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SECCHI_m

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
12	1997	SUMMER	7	1.41	.50000	2.40	0.61	0.23	43	0.50	1.00	1.50	1.80	2.40
12	1998	SUMMER	8	1.91	.50000	4.25	1.49	0.53	78	0.50	1.00	1.25	3.00	4.25
13	1990	FALL	5	2.14	.10000	7.00	2.97	1.33	139	0.10	0.30	0.30	3.00	7.00
13	1990	SPRING	5	1.26	.30000	3.00	1.19	0.53	94	0.30	0.50	0.50	2.00	3.00
13	1990	SUMMER	22	1.20	.02500	4.50	1.34	0.29	112	0.03	0.20	0.45	1.80	4.20
13	1991	FALL	1	0.30	.30000	0.30	.	.	.	0.30	0.30	0.30	0.30	0.30
13	1991	SPRING	6	1.64	.10000	4.30	2.01	0.82	122	0.10	0.15	0.60	4.10	4.30
13	1991	SUMMER	6	0.81	.13000	1.50	0.47	0.19	59	0.13	0.60	0.73	1.15	1.50
13	1991	WINTER	2	0.55	.50000	0.60	0.07	0.05	13	0.50	0.50	0.55	0.60	0.60
13	1992	FALL	10	0.73	.15000	2.20	0.65	0.21	90	0.15	0.20	0.50	1.00	2.20
13	1992	SPRING	15	1.31	.10000	4.00	1.31	0.34	100	0.10	0.28	0.60	2.75	4.00
13	1992	SUMMER	6	1.69	.30000	2.55	0.89	0.36	53	0.30	1.00	1.90	2.50	2.55
13	1992	WINTER	2	1.05	1.0000	1.10	0.07	0.05	7	1.00	1.00	1.05	1.10	1.10
13	1993	FALL	3	2.05	1.1500	3.60	1.35	0.78	66	1.15	1.15	1.40	3.60	3.60
13	1993	SPRING	1	3.00	3.0000	3.00	.	.	.	3.00	3.00	3.00	3.00	3.00
13	1993	SUMMER	8	1.60	.22500	3.50	1.27	0.45	79	0.23	0.23	1.78	2.53	3.50
13	1994	FALL	2	2.25	1.1000	3.40	1.63	1.15	72	1.10	1.10	2.25	3.40	3.40
13	1994	SPRING	1	3.60	3.6000	3.60	.	.	.	3.60	3.60	3.60	3.60	3.60
13	1994	SUMMER	19	1.29	.22500	3.00	0.94	0.22	73	0.23	0.38	1.20	2.20	3.00
13	1995	FALL	4	2.10	.25000	4.00	1.79	0.89	85	0.25	0.60	2.08	3.60	4.00
13	1995	SPRING	1	1.95	1.9500	1.95	.	.	.	1.95	1.95	1.95	1.95	1.95
13	1995	SUMMER	7	1.51	.40000	2.90	0.89	0.34	59	0.40	0.75	1.40	2.20	2.90
13	1995	WINTER	1	1.70	1.7000	1.70	.	.	.	1.70	1.70	1.70	1.70	1.70
13	1996	FALL	9	0.76	.26000	1.40	0.43	0.14	56	0.26	0.40	0.63	1.10	1.40
13	1996	SUMMER	20	1.92	.30000	4.33	1.13	0.25	59	0.36	0.99	2.00	2.74	3.83
13	1997	SUMMER	3	4.83	4.5000	5.50	0.58	0.33	12	4.50	4.50	4.50	5.50	5.50
13	1998	SUMMER	1	1.50	1.5000	1.50	.	.	.	1.50	1.50	1.50	1.50	1.50
18	1991	SUMMER	3	2.95	1.4500	4.40	1.48	0.85	50	1.45	1.45	3.00	4.40	4.40
18	1992	SPRING	1	3.00	3.0000	3.00	.	.	.	3.00	3.00	3.00	3.00	3.00
18	1993	SUMMER	4	3.40	2.0000	5.50	1.59	0.80	47	2.00	2.18	3.05	4.63	5.50
18	1994	SUMMER	1	1.90	1.9000	1.90	.	.	.	1.90	1.90	1.90	1.90	1.90
18	1995	FALL	4	1.93	.99060	3.90	1.33	0.66	69	0.99	1.18	1.41	2.68	3.90

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subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
18	1995	SPRING	1	1.60	1.6000	1.60	.	.	.	1.60	1.60	1.60	1.60	1.60
18	1995	SUMMER	6	3.19	.68580	5.70	1.94	0.79	61	0.69	1.37	3.30	4.80	5.70
18	1996	FALL	3	2.63	1.2192	4.50	1.69	0.97	64	1.22	1.22	2.18	4.50	4.50
18	1996	SUMMER	4	4.01	2.2860	6.40	1.82	0.91	45	2.29	2.62	3.68	5.40	6.40
18	1997	SUMMER	1	1.50	1.5000	1.50	.	.	.	1.50	1.50	1.50	1.50	1.50
18	1998	SUMMER	1	0.75	.75000	0.75	.	.	.	0.75	0.75	0.75	0.75	0.75
20	1990	SPRING	5	2.03	.96000	3.60	1.19	0.53	59	0.96	1.10	1.50	3.00	3.60
20	1990	SUMMER	13	2.03	.90000	3.00	0.71	0.20	35	0.90	1.75	2.10	2.55	3.00
20	1991	FALL	3	3.33	2.4000	5.20	1.62	0.93	48	2.40	2.40	2.40	5.20	5.20
20	1991	SPRING	11	2.59	1.8000	4.00	0.76	0.23	29	1.80	2.00	2.40	2.75	4.00
20	1991	SUMMER	13	2.58	.75000	5.05	1.31	0.36	51	0.75	1.70	2.40	3.05	5.05
20	1991	WINTER	1	2.80	2.8000	2.80	.	.	.	2.80	2.80	2.80	2.80	2.80
20	1992	FALL	5	2.79	1.3000	6.50	2.14	0.96	77	1.30	1.65	1.80	2.70	6.50
20	1992	SPRING	9	3.15	1.0000	6.00	1.57	0.52	50	1.00	2.00	3.00	4.00	6.00
20	1992	SUMMER	6	2.78	1.2000	4.10	1.25	0.51	45	1.20	1.80	2.73	4.10	4.10
20	1992	WINTER	1	2.10	2.1000	2.10	.	.	.	2.10	2.10	2.10	2.10	2.10
20	1993	FALL	6	3.20	2.5000	4.20	0.68	0.28	21	2.50	2.80	2.90	3.90	4.20
20	1993	SPRING	3	2.83	2.2000	3.60	0.71	0.41	25	2.20	2.20	2.70	3.60	3.60
20	1993	SUMMER	11	1.93	1.2000	4.30	0.86	0.26	45	1.20	1.30	1.70	2.05	4.30
20	1994	FALL	9	2.99	1.8000	5.30	1.21	0.40	41	1.80	2.25	2.40	3.80	5.30
20	1994	SUMMER	10	3.50	.90000	7.80	2.15	0.68	61	0.90	2.30	3.00	4.00	7.80
20	1995	FALL	12	3.34	1.4000	5.80	1.39	0.40	42	1.40	2.25	2.80	4.53	5.80
20	1995	SPRING	2	2.78	1.4000	4.15	1.94	1.38	70	1.40	1.40	2.78	4.15	4.15
20	1995	SUMMER	22	3.03	1.0000	5.70	1.19	0.25	39	1.20	2.35	2.98	3.30	4.90
20	1996	FALL	4	2.23	1.6000	3.00	0.68	0.34	30	1.60	1.66	2.16	2.80	3.00
20	1996	SPRING	5	3.10	1.1000	4.50	1.50	0.67	48	1.10	1.90	3.90	4.10	4.50
20	1996	SUMMER	8	3.07	1.8000	4.50	0.98	0.35	32	1.80	2.43	2.88	3.84	4.50
20	1996	WINTER	1	3.55	3.5500	3.55	.	.	.	3.55	3.55	3.55	3.55	3.55
22	1990	FALL	1	0.85	.85000	0.85	.	.	.	0.85	0.85	0.85	0.85	0.85
22	1990	SPRING	1	2.43	2.4250	2.43	.	.	.	2.43	2.43	2.43	2.43	2.43
22	1990	SUMMER	1	0.50	.50000	0.50	.	.	.	0.50	0.50	0.50	0.50	0.50
22	1991	FALL	2	3.75	3.2250	4.28	0.74	0.53	20	3.23	3.23	3.75	4.28	4.28

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
22	1991	SPRING	3	2.32	1.1000	4.00	1.51	0.87	65	1.10	1.10	1.85	4.00	4.00
22	1991	SUMMER	2	2.95	2.4000	3.50	0.78	0.55	26	2.40	2.40	2.95	3.50	3.50
22	1992	FALL	3	2.15	1.5000	2.85	0.68	0.39	31	1.50	1.50	2.10	2.85	2.85
22	1992	SUMMER	3	2.10	1.0000	3.80	1.49	0.86	71	1.00	1.00	1.50	3.80	3.80
22	1993	SUMMER	1	0.15	.15000	0.15	.	.	.	0.15	0.15	0.15	0.15	0.15
22	1995	FALL	1	0.75	.75000	0.75	.	.	.	0.75	0.75	0.75	0.75	0.75
22	1995	SPRING	1	0.80	.80000	0.80	.	.	.	0.80	0.80	0.80	0.80	0.80
22	1995	SUMMER	1	2.20	2.2000	2.20	.	.	.	2.20	2.20	2.20	2.20	2.20
24	1990	FALL	4	1.18	.54000	2.10	0.77	0.38	65	0.54	0.55	1.04	1.81	2.10
24	1990	SPRING	3	1.02	.20000	2.29	1.11	0.64	109	0.20	0.20	0.58	2.29	2.29
24	1990	SUMMER	3	1.20	.20000	2.65	1.29	0.74	107	0.20	0.20	0.75	2.65	2.65
24	1990	WINTER	1	3.00	3.0000	3.00	.	.	.	3.00	3.00	3.00	3.00	3.00
24	1991	FALL	1	2.67	2.6650	2.67	.	.	.	2.67	2.67	2.67	2.67	2.67
24	1991	SPRING	1	3.58	3.5750	3.58	.	.	.	3.58	3.58	3.58	3.58	3.58
24	1991	SUMMER	2	2.11	.71500	3.50	1.97	1.39	93	0.72	0.72	2.11	3.50	3.50
24	1991	WINTER	1	3.66	3.6600	3.66	.	.	.	3.66	3.66	3.66	3.66	3.66
24	1992	FALL	1	3.00	3.0000	3.00	.	.	.	3.00	3.00	3.00	3.00	3.00
24	1992	SPRING	6	1.12	.20000	3.40	1.23	0.50	110	0.20	0.30	0.65	1.50	3.40
24	1992	SUMMER	2	1.88	.76000	3.00	1.58	1.12	84	0.76	0.76	1.88	3.00	3.00
24	1992	WINTER	2	2.20	.81000	3.59	1.96	1.39	89	0.81	0.81	2.20	3.59	3.59
24	1993	SPRING	2	0.74	.70000	0.78	0.05	0.04	7	0.70	0.70	0.74	0.78	0.78
24	1993	SUMMER	2	1.62	.61500	2.63	1.42	1.01	88	0.62	0.62	1.62	2.63	2.63
24	1993	WINTER	1	0.83	.82500	0.83	.	.	.	0.83	0.83	0.83	0.83	0.83
24	1994	FALL	1	2.67	2.6650	2.67	.	.	.	2.67	2.67	2.67	2.67	2.67
24	1994	SPRING	2	1.24	.64000	1.83	0.84	0.60	68	0.64	0.64	1.24	1.83	1.83
24	1994	SUMMER	2	2.01	.84000	3.18	1.65	1.17	82	0.84	0.84	2.01	3.18	3.18
24	1994	WINTER	1	3.40	3.4000	3.40	.	.	.	3.40	3.40	3.40	3.40	3.40
24	1995	SUMMER	2	0.55	.33000	0.78	0.31	0.22	57	0.33	0.33	0.55	0.78	0.78
24	1995	WINTER	2	2.52	.70500	4.34	2.57	1.82	102	0.71	0.71	2.52	4.34	4.34
24	1996	SPRING	1	0.75	.75000	0.75	.	.	.	0.75	0.75	0.75	0.75	0.75
24	1996	SUMMER	1	0.62	.61500	0.62	.	.	.	0.62	0.62	0.62	0.62	0.62
24	1997	FALL	1	1.08	1.0750	1.08	.	.	.	1.08	1.08	1.08	1.08	1.08

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subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
24	1997	SPRING	1	0.95	.95000	0.95	.	.	.	0.95	0.95	0.95	0.95	0.95
24	1997	SUMMER	1	0.90	.90000	0.90	.	.	.	0.90	0.90	0.90	0.90	0.90
80	1990	SUMMER	1	1.30	1.3000	1.30	.	.	.	1.30	1.30	1.30	1.30	1.30
80	1991	SUMMER	1	4.60	4.6000	4.60	.	.	.	4.60	4.60	4.60	4.60	4.60
80	1993	FALL	1	2.90	2.9000	2.90	.	.	.	2.90	2.90	2.90	2.90	2.90
80	1993	SUMMER	1	3.70	3.7000	3.70	.	.	.	3.70	3.70	3.70	3.70	3.70
80	1995	SUMMER	2	2.20	1.7000	2.70	0.71	0.50	32	1.70	1.70	2.20	2.70	2.70
80	1996	SUMMER	1	1.90	1.9000	1.90	.	.	.	1.90	1.90	1.90	1.90	1.90
80	1997	SUMMER	1	1.50	1.5000	1.50	.	.	.	1.50	1.50	1.50	1.50	1.50
80	1998	SUMMER	1	0.50	.50000	0.50	.	.	.	0.50	0.50	0.50	0.50	0.50
81	1990	FALL	1	1.76	1.7563	1.76	.	.	.	1.76	1.76	1.76	1.76	1.76

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subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
10	1994	FALL	3	0.28	.25000	0.30	0.03	0.01	9	0.25	0.25	0.28	0.30	0.30
10	1994	SPRING	3	0.42	.38500	0.45	0.03	0.02	7	0.39	0.39	0.42	0.45	0.45
10	1994	SUMMER	3	0.25	.24000	0.25	0.01	0.00	2	0.24	0.24	0.25	0.25	0.25
10	1994	WINTER	3	0.38	.36000	0.39	0.02	0.01	5	0.36	0.36	0.39	0.39	0.39
10	1995	FALL	3	0.28	.28000	0.28	0.00	0.00	0	0.28	0.28	0.28	0.28	0.28
10	1995	SPRING	3	0.57	.53500	0.59	0.03	0.02	5	0.54	0.54	0.59	0.59	0.59
10	1995	SUMMER	3	0.30	.29000	0.30	0.01	0.00	2	0.29	0.29	0.30	0.30	0.30
10	1995	WINTER	3	0.55	.51500	0.60	0.04	0.03	8	0.52	0.52	0.54	0.60	0.60
13	1990	FALL	1	0.96	.96000	0.96	.	.	.	0.96	0.96	0.96	0.96	0.96
13	1990	SPRING	1	0.39	.38500	0.39	.	.	.	0.39	0.39	0.39	0.39	0.39
13	1990	SUMMER	2	1.37	.38000	2.35	1.39	0.99	102	0.38	0.38	1.37	2.35	2.35
13	1990	WINTER	1	0.34	.34000	0.34	.	.	.	0.34	0.34	0.34	0.34	0.34
13	1991	FALL	1	0.63	.62500	0.63	.	.	.	0.63	0.63	0.63	0.63	0.63
13	1991	SPRING	1	0.52	.52000	0.52	.	.	.	0.52	0.52	0.52	0.52	0.52
13	1991	SUMMER	1	0.36	.36000	0.36	.	.	.	0.36	0.36	0.36	0.36	0.36
13	1991	WINTER	1	0.60	.60000	0.60	.	.	.	0.60	0.60	0.60	0.60	0.60
13	1992	FALL	2	1.57	.87000	2.26	0.98	0.70	63	0.87	0.87	1.57	2.26	2.26
13	1992	SPRING	2	1.59	.52000	2.66	1.51	1.07	95	0.52	0.52	1.59	2.66	2.66
13	1992	SUMMER	1	0.48	.48000	0.48	.	.	.	0.48	0.48	0.48	0.48	0.48
13	1992	WINTER	1	0.72	.72000	0.72	.	.	.	0.72	0.72	0.72	0.72	0.72
13	1993	FALL	2	2.04	1.9500	2.13	0.13	0.09	6	1.95	1.95	2.04	2.13	2.13
13	1993	SPRING	2	1.94	.88000	3.00	1.50	1.06	77	0.88	0.88	1.94	3.00	3.00
13	1993	SUMMER	2	1.72	.92000	2.51	1.12	0.80	66	0.92	0.92	1.72	2.51	2.51
13	1993	WINTER	1	2.32	2.3200	2.32	.	.	.	2.32	2.32	2.32	2.32	2.32
13	1994	FALL	2	1.77	.74500	2.80	1.45	1.03	82	0.75	0.75	1.77	2.80	2.80
13	1994	SPRING	2	1.60	.49000	2.72	1.57	1.11	98	0.49	0.49	1.60	2.72	2.72
13	1994	SUMMER	2	1.98	.59000	3.36	1.96	1.39	99	0.59	0.59	1.98	3.36	3.36
13	1994	WINTER	2	1.44	.36000	2.52	1.53	1.08	106	0.36	0.36	1.44	2.52	2.52
13	1995	FALL	2	2.12	1.2900	2.95	1.17	0.83	55	1.29	1.29	2.12	2.95	2.95
13	1995	SPRING	2	1.74	.57000	2.92	1.66	1.17	95	0.57	0.57	1.74	2.92	2.92
13	1995	SUMMER	1	2.48	2.4800	2.48	.	.	.	2.48	2.48	2.48	2.48	2.48
13	1995	WINTER	2	1.79	.75000	2.82	1.46	1.04	82	0.75	0.75	1.79	2.82	2.82

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subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
13	1996	FALL	4	1.16	.61000	2.31	0.78	0.39	67	0.61	0.69	0.87	1.63	2.31
13	1996	SPRING	3	1.10	.37500	2.54	1.24	0.72	112	0.38	0.38	0.40	2.54	2.54
13	1996	SUMMER	4	1.14	.20000	2.92	1.24	0.62	109	0.20	0.29	0.72	1.99	2.92
13	1996	WINTER	2	0.79	.68000	0.90	0.16	0.11	20	0.68	0.68	0.79	0.90	0.90
13	1997	FALL	7	0.70	.18000	1.58	0.47	0.18	68	0.18	0.32	0.66	1.00	1.58
13	1997	SPRING	3	1.35	.54000	2.45	0.99	0.57	73	0.54	0.54	1.07	2.45	2.45
13	1997	SUMMER	7	0.78	.32000	1.47	0.39	0.15	49	0.32	0.47	0.69	1.00	1.47
13	1997	WINTER	2	0.59	.45500	0.72	0.19	0.13	32	0.46	0.46	0.59	0.72	0.72
13	1998	SPRING	4	1.45	.60000	3.21	1.19	0.59	82	0.60	0.78	1.00	2.13	3.21
13	1998	WINTER	3	0.51	.30000	0.71	0.21	0.12	40	0.30	0.30	0.53	0.71	0.71
22	1990	FALL	1	0.33	.33000	0.33	.	.	.	0.33	0.33	0.33	0.33	0.33
22	1990	SPRING	1	1.96	1.9550	1.96	.	.	.	1.96	1.96	1.96	1.96	1.96
22	1990	SUMMER	1	1.02	1.0200	1.02	.	.	.	1.02	1.02	1.02	1.02	1.02
22	1991	FALL	2	0.77	.46000	1.07	0.43	0.31	56	0.46	0.46	0.77	1.07	1.07
22	1991	SPRING	3	0.72	.16500	1.51	0.70	0.40	96	0.17	0.17	0.50	1.51	1.51
22	1991	SUMMER	2	0.43	.15500	0.71	0.39	0.28	91	0.16	0.16	0.43	0.71	0.71
22	1992	FALL	2	0.30	.29000	0.30	0.01	0.01	2	0.29	0.29	0.30	0.30	0.30
22	1992	SPRING	1	0.47	.47000	0.47	.	.	.	0.47	0.47	0.47	0.47	0.47
22	1992	SUMMER	1	0.14	.14000	0.14	.	.	.	0.14	0.14	0.14	0.14	0.14
22	1993	SPRING	3	0.34	.23000	0.44	0.11	0.06	31	0.23	0.23	0.35	0.44	0.44
22	1993	SUMMER	5	0.82	.29000	2.41	0.90	0.40	110	0.29	0.32	0.40	0.69	2.41
22	1993	WINTER	2	0.39	.36000	0.42	0.04	0.03	11	0.36	0.36	0.39	0.42	0.42
22	1995	FALL	2	0.75	.50000	1.00	0.35	0.25	47	0.50	0.50	0.75	1.00	1.00
22	1995	SPRING	1	0.53	.53000	0.53	.	.	.	0.53	0.53	0.53	0.53	0.53
22	1995	SUMMER	1	0.65	.65000	0.65	.	.	.	0.65	0.65	0.65	0.65	0.65
24	1990	FALL	2	0.50	.44000	0.56	0.08	0.06	17	0.44	0.44	0.50	0.56	0.56
24	1990	SPRING	2	0.62	.62000	0.62	0.00	0.00	0	0.62	0.62	0.62	0.62	0.62
24	1990	SUMMER	2	1.00	.98500	1.01	0.01	0.01	1	0.99	0.99	1.00	1.01	1.01
24	1992	SPRING	2	3.00	1.6700	4.33	1.88	1.33	63	1.67	1.67	3.00	4.33	4.33
24	1993	SPRING	7	1.41	.45000	3.64	1.12	0.42	79	0.45	0.57	0.89	1.90	3.64
24	1995	SUMMER	3	1.01	.80000	1.30	0.26	0.15	26	0.80	0.80	0.93	1.30	1.30
24	1997	FALL	1	0.12	.12250	0.12	.	.	.	0.12	0.12	0.12	0.12	0.12

Aggregate Nutrient Ecoregion: III
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from 1990 to 1998
Total_Nitrogen_mg_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
24	1997	SPRING	1	0.45	.45000	0.45	.	.	.	0.45	0.45	0.45	0.45	0.45
24	1997	SUMMER	1	0.68	.67500	0.68	.	.	.	0.68	0.68	0.68	0.68	0.68

Lakes and Reservoirs
Descriptive Statistics by Subecoregion, Year and Season
from 1990 to 1999
Total_Phosphorus_ug_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
6	1990	FALL	1	120.00	120.00	120.00	.	.	.	120.00	120.00	120.00	120.00	120.00
6	1990	SPRING	3	40.00	30.000	60.00	17.32	10.00	43	30.00	30.00	30.00	60.00	60.00
6	1990	SUMMER	1	40.00	40.000	40.00	.	.	.	40.00	40.00	40.00	40.00	40.00
6	1991	FALL	1	30.00	30.000	30.00	.	.	.	30.00	30.00	30.00	30.00	30.00
6	1991	SPRING	1	30.00	30.000	30.00	.	.	.	30.00	30.00	30.00	30.00	30.00
6	1991	SUMMER	1	30.00	30.000	30.00	.	.	.	30.00	30.00	30.00	30.00	30.00
6	1992	FALL	3	553.33	490.00	640.00	77.67	44.85	14	490.00	490.00	530.00	640.00	640.00
6	1992	WINTER	3	266.67	250.00	300.00	28.87	16.67	11	250.00	250.00	250.00	300.00	300.00
6	1993	FALL	3	343.33	330.00	350.00	11.55	6.67	3	330.00	330.00	350.00	350.00	350.00
6	1993	SPRING	3	196.67	190.00	200.00	5.77	3.33	3	190.00	190.00	200.00	200.00	200.00
6	1993	SUMMER	3	206.67	200.00	220.00	11.55	6.67	6	200.00	200.00	200.00	220.00	220.00
6	1993	WINTER	3	201.67	190.00	220.00	16.07	9.28	8	190.00	190.00	195.00	220.00	220.00
6	1994	FALL	1	8.00	8.0000	8.00	.	.	.	8.00	8.00	8.00	8.00	8.00
6	1994	SPRING	4	87.50	20.000	130.00	47.17	23.58	54	20.00	60.00	100.00	115.00	130.00
6	1994	SUMMER	1	185.00	185.00	185.00	.	.	.	185.00	185.00	185.00	185.00	185.00
6	1994	WINTER	3	150.00	150.00	150.00	0.00	0.00	0	150.00	150.00	150.00	150.00	150.00
6	1996	FALL	1	490.00	490.00	490.00	.	.	.	490.00	490.00	490.00	490.00	490.00
6	1996	SUMMER	1	185.00	185.00	185.00	.	.	.	185.00	185.00	185.00	185.00	185.00
6	1996	WINTER	1	260.00	260.00	260.00	.	.	.	260.00	260.00	260.00	260.00	260.00
6	1997	FALL	1	160.00	160.00	160.00	.	.	.	160.00	160.00	160.00	160.00	160.00
6	1997	SPRING	1	220.00	220.00	220.00	.	.	.	220.00	220.00	220.00	220.00	220.00
6	1997	SUMMER	1	530.00	530.00	530.00	.	.	.	530.00	530.00	530.00	530.00	530.00
10	1990	FALL	3	73.33	30.000	120.00	45.09	26.03	61	30.00	30.00	70.00	120.00	120.00
10	1990	SPRING	4	80.00	40.000	150.00	49.67	24.83	62	40.00	45.00	65.00	115.00	150.00
10	1990	SUMMER	4	197.50	40.000	640.00	295.11	147.56	149	40.00	45.00	55.00	350.00	640.00
10	1991	FALL	2	35.00	20.000	50.00	21.21	15.00	61	20.00	20.00	35.00	50.00	50.00
10	1991	SPRING	2	65.00	50.000	80.00	21.21	15.00	33	50.00	50.00	65.00	80.00	80.00
10	1991	SUMMER	2	80.00	80.000	80.00	0.00	0.00	0	80.00	80.00	80.00	80.00	80.00
10	1991	WINTER	2	70.00	60.000	80.00	14.14	10.00	20	60.00	60.00	70.00	80.00	80.00
10	1992	FALL	3	105.00	10.000	265.00	139.37	80.47	133	10.00	10.00	40.00	265.00	265.00
10	1992	SPRING	2	50.00	30.000	70.00	28.28	20.00	57	30.00	30.00	50.00	70.00	70.00
10	1992	SUMMER	5	128.00	40.000	380.00	142.37	63.67	111	40.00	50.00	80.00	90.00	380.00

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Total_Phosphorus_ug_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
10	1992	WINTER	2	60.00	10.000	110.00	70.71	50.00	118	10.00	10.00	60.00	110.00	110.00
10	1993	FALL	3	130.00	60.000	260.00	112.69	65.06	87	60.00	60.00	70.00	260.00	260.00
10	1993	SPRING	2	65.00	40.000	90.00	35.36	25.00	54	40.00	40.00	65.00	90.00	90.00
10	1993	SUMMER	6	137.50	30.000	410.00	144.91	59.16	105	30.00	45.00	75.00	190.00	410.00
10	1993	WINTER	2	60.00	40.000	80.00	28.28	20.00	47	40.00	40.00	60.00	80.00	80.00
10	1994	FALL	6	78.83	20.000	275.00	96.65	39.46	123	20.00	41.00	43.50	50.00	275.00
10	1994	SPRING	6	93.50	29.000	370.00	136.13	55.58	146	29.00	30.00	33.50	65.00	370.00
10	1994	SUMMER	6	119.00	20.000	510.00	193.03	78.80	162	20.00	22.00	46.00	70.00	510.00
10	1994	WINTER	5	43.60	24.000	110.00	37.21	16.64	85	24.00	25.00	29.00	30.00	110.00
10	1995	FALL	6	45.92	26.500	110.00	32.57	13.30	71	26.50	27.00	31.00	50.00	110.00
10	1995	SPRING	6	63.00	35.000	120.00	29.33	11.97	47	35.00	51.00	56.00	60.00	120.00
10	1995	SUMMER	6	66.92	30.000	210.00	70.97	28.97	106	30.00	31.50	35.00	60.00	210.00
10	1995	WINTER	5	49.40	30.000	90.00	24.07	10.76	49	30.00	36.50	38.50	52.00	90.00
10	1996	FALL	2	100.00	80.000	120.00	28.28	20.00	28	80.00	80.00	100.00	120.00	120.00
10	1996	SPRING	2	55.00	40.000	70.00	21.21	15.00	39	40.00	40.00	55.00	70.00	70.00
10	1996	SUMMER	4	82.50	50.000	110.00	25.00	12.50	30	50.00	65.00	85.00	100.00	110.00
10	1996	WINTER	2	45.00	20.000	70.00	35.36	25.00	79	20.00	20.00	45.00	70.00	70.00
10	1997	FALL	2	105.00	70.000	140.00	49.50	35.00	47	70.00	70.00	105.00	140.00	140.00
10	1997	SPRING	2	70.00	55.000	85.00	21.21	15.00	30	55.00	55.00	70.00	85.00	85.00
10	1997	SUMMER	3	156.67	70.000	300.00	125.03	72.19	80	70.00	70.00	100.00	300.00	300.00
10	1997	WINTER	2	55.00	30.000	80.00	35.36	25.00	64	30.00	30.00	55.00	80.00	80.00
10	1998	FALL	5	115.30	39.000	204.00	60.60	27.10	53	39.00	88.50	113.00	132.00	204.00
10	1998	SPRING	2	67.50	55.000	80.00	17.68	12.50	26	55.00	55.00	67.50	80.00	80.00
10	1998	SUMMER	8	98.13	34.000	257.00	88.66	31.35	90	34.00	36.50	55.00	155.50	257.00
10	1998	WINTER	3	136.67	89.000	169.00	42.15	24.33	31	89.00	89.00	152.00	169.00	169.00
10	1999	SPRING	5	72.20	56.000	84.00	11.56	5.17	16	56.00	64.50	78.00	78.50	84.00
10	1999	WINTER	4	107.75	77.000	143.00	27.94	13.97	26	77.00	87.00	105.50	128.50	143.00
12	1990	SUMMER	5	68.00	10.000	115.00	44.24	19.79	65	10.00	35.00	80.00	100.00	115.00
12	1991	FALL	2	85.00	20.000	150.00	91.92	65.00	108	20.00	20.00	85.00	150.00	150.00
12	1991	SPRING	2	82.50	15.000	150.00	95.46	67.50	116	15.00	15.00	82.50	150.00	150.00
12	1991	SUMMER	6	91.67	20.000	190.00	71.04	29.00	77	20.00	25.00	75.00	165.00	190.00
12	1991	WINTER	2	85.00	20.000	150.00	91.92	65.00	108	20.00	20.00	85.00	150.00	150.00

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Total_Phosphorus_ug_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
12	1992	SUMMER	3	61.67	50.000	85.00	20.21	11.67	33	50.00	50.00	50.00	85.00	85.00
12	1992	WINTER	2	97.50	35.000	160.00	88.39	62.50	91	35.00	35.00	97.50	160.00	160.00
12	1993	SUMMER	2	40.00	20.000	60.00	28.28	20.00	71	20.00	20.00	40.00	60.00	60.00
12	1994	SUMMER	4	110.00	90.000	160.00	33.67	16.83	31	90.00	90.00	95.00	130.00	160.00
12	1995	SUMMER	3	86.67	75.000	95.00	10.41	6.01	12	75.00	75.00	90.00	95.00	95.00
12	1996	SUMMER	5	54.00	25.000	80.00	20.43	9.14	38	25.00	45.00	60.00	60.00	80.00
12	1997	SUMMER	8	134.38	45.000	310.00	102.94	36.39	77	45.00	57.50	77.50	225.00	310.00
12	1998	SUMMER	8	65.63	.00000	210.00	81.39	28.78	124	0.00	0.00	42.50	115.00	210.00
13	1990	FALL	2	60.00	40.000	80.00	28.28	20.00	47	40.00	40.00	60.00	80.00	80.00
13	1990	SPRING	7	41.43	20.000	75.00	25.61	9.68	62	20.00	20.00	25.00	70.00	75.00
13	1990	SUMMER	24	107.15	1.5000	680.00	167.91	34.28	157	10.00	25.00	45.00	110.00	560.00
13	1990	WINTER	1	30.00	30.000	30.00	.	.	.	30.00	30.00	30.00	30.00	30.00
13	1991	FALL	2	165.00	80.000	250.00	120.21	85.00	73	80.00	80.00	165.00	250.00	250.00
13	1991	SPRING	9	66.11	10.000	175.00	52.31	17.44	79	10.00	30.00	50.00	90.00	175.00
13	1991	SUMMER	7	86.07	2.5000	240.00	80.36	30.37	93	2.50	30.00	60.00	130.00	240.00
13	1991	WINTER	4	80.00	60.000	100.00	16.33	8.16	20	60.00	70.00	80.00	90.00	100.00
13	1992	FALL	14	222.50	30.000	760.00	195.29	52.19	88	30.00	80.00	185.00	320.00	760.00
13	1992	SPRING	18	71.94	2.5000	700.00	159.27	37.54	221	2.50	10.00	35.00	55.00	700.00
13	1992	SUMMER	14	42.32	6.2500	120.00	43.37	11.59	102	6.25	10.00	30.00	75.00	120.00
13	1992	WINTER	3	268.33	70.000	620.00	305.38	176.31	114	70.00	70.00	115.00	620.00	620.00
13	1993	FALL	6	302.50	10.000	660.00	270.37	110.38	89	10.00	60.00	272.50	540.00	660.00
13	1993	SPRING	4	237.50	50.000	700.00	310.95	155.48	131	50.00	55.00	100.00	420.00	700.00
13	1993	SUMMER	11	143.18	10.000	800.00	223.68	67.44	156	10.00	30.00	80.00	150.00	800.00
13	1993	WINTER	2	470.00	220.00	720.00	353.55	250.00	75	220.00	220.00	470.00	720.00	720.00
13	1994	FALL	4	432.50	75.000	860.00	396.92	198.46	92	75.00	95.00	397.50	770.00	860.00
13	1994	SPRING	3	296.67	30.000	800.00	436.16	251.82	147	30.00	30.00	60.00	800.00	800.00
13	1994	SUMMER	23	105.33	2.5000	650.00	183.85	38.34	175	10.00	15.00	25.00	90.00	630.00
13	1994	WINTER	3	473.33	60.000	800.00	377.54	217.97	80	60.00	60.00	560.00	800.00	800.00
13	1995	FALL	6	270.83	15.000	750.00	307.17	125.40	113	15.00	50.00	125.00	560.00	750.00
13	1995	SPRING	4	347.50	40.000	840.00	373.73	186.87	108	40.00	57.50	255.00	637.50	840.00
13	1995	SUMMER	9	203.61	2.5000	580.00	230.38	76.79	113	2.50	30.00	70.00	440.00	580.00
13	1995	WINTER	3	350.00	50.000	880.00	460.33	265.77	132	50.00	50.00	120.00	880.00	880.00

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Total_Phosphorus_ug_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
13	1996	FALL	14	170.09	10.000	760.00	229.01	61.21	135	10.00	15.00	57.50	325.00	760.00
13	1996	SPRING	3	306.67	50.000	790.00	418.85	241.82	137	50.00	50.00	80.00	790.00	790.00
13	1996	SUMMER	24	79.27	2.5000	700.00	155.35	31.71	196	10.00	17.50	25.00	45.00	325.00
13	1996	WINTER	3	326.67	40.000	840.00	445.57	257.25	136	40.00	40.00	100.00	840.00	840.00
13	1997	FALL	7	149.29	20.000	705.00	247.53	93.56	166	20.00	30.00	40.00	110.00	705.00
13	1997	SPRING	3	273.33	30.000	730.00	395.77	228.50	145	30.00	30.00	60.00	730.00	730.00
13	1997	SUMMER	10	130.50	10.000	760.00	225.05	71.17	172	10.00	30.00	52.50	116.00	760.00
13	1997	WINTER	2	415.00	30.000	800.00	544.47	385.00	131	30.00	30.00	415.00	800.00	800.00
13	1998	SPRING	4	207.50	20.000	690.00	322.63	161.32	155	20.00	30.00	60.00	385.00	690.00
13	1998	SUMMER	1	30.00	30.000	30.00	.	.	.	30.00	30.00	30.00	30.00	30.00
13	1998	WINTER	3	290.00	30.000	780.00	424.62	245.15	146	30.00	30.00	60.00	780.00	780.00
18	1991	SUMMER	3	13.33	10.000	20.00	5.77	3.33	43	10.00	10.00	10.00	20.00	20.00
18	1992	SPRING	1	20.00	20.000	20.00	.	.	.	20.00	20.00	20.00	20.00	20.00
18	1993	SUMMER	4	15.00	10.000	20.00	5.77	2.89	38	10.00	10.00	15.00	20.00	20.00
18	1994	SUMMER	3	620.00	10.000	1200.00	595.57	343.85	96	10.00	10.00	650.00	1200.0	1200.0
18	1995	FALL	4	36.25	10.000	100.00	42.70	21.35	118	10.00	12.50	17.50	60.00	100.00
18	1995	SPRING	2	4.38	2.5000	6.25	2.65	1.88	61	2.50	2.50	4.38	6.25	6.25
18	1995	SUMMER	6	14.58	2.5000	20.00	7.14	2.92	49	2.50	10.00	17.50	20.00	20.00
18	1996	FALL	4	16.25	10.000	20.00	4.79	2.39	29	10.00	12.50	17.50	20.00	20.00
18	1996	SUMMER	4	13.75	10.000	25.00	7.50	3.75	55	10.00	10.00	10.00	17.50	25.00
18	1997	SUMMER	1	55.00	55.000	55.00	.	.	.	55.00	55.00	55.00	55.00	55.00
18	1998	SUMMER	1	110.00	110.00	110.00	.	.	.	110.00	110.00	110.00	110.00	110.00
20	1990	FALL	1	50.00	50.000	50.00	.	.	.	50.00	50.00	50.00	50.00	50.00
20	1990	SPRING	6	26.08	1.5000	60.00	20.71	8.46	79	1.50	10.00	25.00	35.00	60.00
20	1990	SUMMER	13	22.42	8.0000	65.00	18.76	5.20	84	8.00	10.00	10.00	25.00	65.00
20	1991	FALL	6	80.83	2.5000	390.00	153.63	62.72	190	2.50	2.50	10.00	70.00	390.00
20	1991	SPRING	12	65.10	2.5000	480.00	134.99	38.97	207	2.50	8.13	22.50	30.00	480.00
20	1991	SUMMER	14	8.39	2.5000	30.00	7.99	2.13	95	2.50	2.50	6.25	10.00	30.00
20	1991	WINTER	1	40.00	40.000	40.00	.	.	.	40.00	40.00	40.00	40.00	40.00
20	1992	FALL	9	130.00	20.000	350.00	104.61	34.87	80	20.00	55.00	110.00	175.00	350.00
20	1992	SPRING	12	36.15	2.5000	150.00	41.87	12.09	116	2.50	4.38	25.00	50.00	150.00
20	1992	SUMMER	6	15.63	2.5000	45.00	15.53	6.34	99	2.50	6.25	10.00	20.00	45.00

Aggregate Nutrient Ecoregion: III
Lakes and Reservoirs
Descriptive Statistics by Subecoregion, Year and Season
from 1990 to 1999
Total_Phosphorus_ug_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
20	1992	WINTER	1	2.50	2.5000	2.50	.	.	.	2.50	2.50	2.50	2.50	2.50
20	1993	FALL	8	8.13	2.5000	20.00	6.78	2.40	83	2.50	2.50	6.25	12.50	20.00
20	1993	SPRING	3	30.00	10.000	50.00	20.00	11.55	67	10.00	10.00	30.00	50.00	50.00
20	1993	SUMMER	16	6.88	2.5000	20.00	6.49	1.62	94	2.50	2.50	2.50	10.00	20.00
20	1994	FALL	9	25.56	2.5000	120.00	38.60	12.87	151	2.50	2.50	6.25	20.00	120.00
20	1994	SPRING	1	2.50	2.5000	2.50	.	.	.	2.50	2.50	2.50	2.50	2.50
20	1994	SUMMER	11	30.23	2.5000	145.00	41.06	12.38	136	2.50	10.00	15.00	25.00	145.00
20	1994	WINTER	2	6.25	2.5000	10.00	5.30	3.75	85	2.50	2.50	6.25	10.00	10.00
20	1995	FALL	13	11.92	2.5000	60.00	15.71	4.36	132	2.50	2.50	6.25	10.00	60.00
20	1995	SPRING	4	29.38	2.5000	75.00	32.56	16.28	111	2.50	6.25	20.00	52.50	75.00
20	1995	SUMMER	23	13.10	2.5000	65.00	16.59	3.46	127	2.50	2.50	10.00	15.00	45.00
20	1995	WINTER	3	5.00	2.5000	10.00	4.33	2.50	87	2.50	2.50	2.50	10.00	10.00
20	1996	FALL	6	17.29	2.5000	45.00	14.84	6.06	86	2.50	10.00	13.13	20.00	45.00
20	1996	SPRING	8	14.53	2.5000	55.00	17.27	6.11	119	2.50	4.38	10.00	15.00	55.00
20	1996	SUMMER	10	26.63	2.5000	80.00	30.16	9.54	113	2.50	6.25	10.00	50.00	80.00
20	1996	WINTER	4	9.06	6.2500	10.00	1.88	0.94	21	6.25	8.13	10.00	10.00	10.00
20	1997	SPRING	1	100.00	100.00	100.00	.	.	.	100.00	100.00	100.00	100.00	100.00
20	1999	SUMMER	2	0.00	.00000	0.00	0.00	0.00	.	0.00	0.00	0.00	0.00	0.00
22	1990	FALL	1	25.00	25.000	25.00	.	.	.	25.00	25.00	25.00	25.00	25.00
22	1990	SPRING	1	135.00	135.00	135.00	.	.	.	135.00	135.00	135.00	135.00	135.00
22	1990	SUMMER	2	55.00	40.000	70.00	21.21	15.00	39	40.00	40.00	55.00	70.00	70.00
22	1991	FALL	2	35.00	10.000	60.00	35.36	25.00	101	10.00	10.00	35.00	60.00	60.00
22	1991	SPRING	3	8.75	2.5000	21.25	10.83	6.25	124	2.50	2.50	2.50	21.25	21.25
22	1991	SUMMER	3	39.17	2.5000	70.00	34.13	19.70	87	2.50	2.50	45.00	70.00	70.00
22	1992	FALL	5	45.00	.00000	135.00	57.45	25.69	128	0.00	10.00	10.00	70.00	135.00
22	1992	SPRING	1	2.50	2.5000	2.50	.	.	.	2.50	2.50	2.50	2.50	2.50
22	1992	SUMMER	5	52.00	10.000	120.00	44.53	19.91	86	10.00	15.00	50.00	65.00	120.00
22	1993	SUMMER	7	72.86	20.000	200.00	68.00	25.70	93	20.00	20.00	40.00	110.00	200.00
22	1993	WINTER	2	30.00	30.000	30.00	0.00	0.00	0	30.00	30.00	30.00	30.00	30.00
22	1994	SUMMER	1	50.00	50.000	50.00	.	.	.	50.00	50.00	50.00	50.00	50.00
22	1995	FALL	2	20.00	20.000	20.00	0.00	0.00	0	20.00	20.00	20.00	20.00	20.00
22	1995	SPRING	1	20.00	20.000	20.00	.	.	.	20.00	20.00	20.00	20.00	20.00

Descriptive Statistics by Subecoregion, Year and Season
from 1990 to 1999
Total_Phosphorus_ug_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
22	1995	SUMMER	1	20.00	20.000	20.00	.	.	.	20.00	20.00	20.00	20.00	20.00
22	1996	SPRING	1	180.00	180.00	180.00	.	.	.	180.00	180.00	180.00	180.00	180.00
22	1999	SUMMER	2	60.00	50.000	70.00	14.14	10.00	24	50.00	50.00	60.00	70.00	70.00
24	1990	FALL	4	20.63	2.5000	50.00	20.85	10.43	101	2.50	6.25	15.00	35.00	50.00
24	1990	SPRING	3	27.08	6.2500	50.00	21.95	12.67	81	6.25	6.25	25.00	50.00	50.00
24	1990	SUMMER	3	20.83	2.5000	35.00	16.65	9.61	80	2.50	2.50	25.00	35.00	35.00
24	1990	WINTER	1	20.00	20.000	20.00	.	.	.	20.00	20.00	20.00	20.00	20.00
24	1991	FALL	1	15.00	15.000	15.00	.	.	.	15.00	15.00	15.00	15.00	15.00
24	1991	SPRING	1	20.00	20.000	20.00	.	.	.	20.00	20.00	20.00	20.00	20.00
24	1991	SUMMER	2	52.50	50.000	55.00	3.54	2.50	7	50.00	50.00	52.50	55.00	55.00
24	1991	WINTER	1	15.00	15.000	15.00	.	.	.	15.00	15.00	15.00	15.00	15.00
24	1992	FALL	1	40.00	40.000	40.00	.	.	.	40.00	40.00	40.00	40.00	40.00
24	1992	SPRING	6	391.67	10.000	960.00	422.35	172.42	108	10.00	60.00	215.00	890.00	960.00
24	1992	SUMMER	5	35.50	2.5000	70.00	30.12	13.47	85	2.50	20.00	20.00	65.00	70.00
24	1992	WINTER	6	41.67	20.000	70.00	16.33	6.67	39	20.00	35.00	40.00	45.00	70.00
24	1993	FALL	1	20.00	20.000	20.00	.	.	.	20.00	20.00	20.00	20.00	20.00
24	1993	SPRING	8	263.13	25.000	1630.00	558.69	197.53	212	25.00	25.00	27.50	172.50	1630.0
24	1993	SUMMER	2	50.00	40.000	60.00	14.14	10.00	28	40.00	40.00	50.00	60.00	60.00
24	1993	WINTER	1	45.00	45.000	45.00	.	.	.	45.00	45.00	45.00	45.00	45.00
24	1994	SPRING	1	65.00	65.000	65.00	.	.	.	65.00	65.00	65.00	65.00	65.00
24	1995	SUMMER	3	33.33	20.000	60.00	23.09	13.33	69	20.00	20.00	20.00	60.00	60.00
24	1995	WINTER	1	45.00	45.000	45.00	.	.	.	45.00	45.00	45.00	45.00	45.00
24	1996	SPRING	1	40.00	40.000	40.00	.	.	.	40.00	40.00	40.00	40.00	40.00
24	1996	SUMMER	1	65.00	65.000	65.00	.	.	.	65.00	65.00	65.00	65.00	65.00
24	1997	FALL	1	20.00	20.000	20.00	.	.	.	20.00	20.00	20.00	20.00	20.00
24	1997	SPRING	1	25.00	25.000	25.00	.	.	.	25.00	25.00	25.00	25.00	25.00
24	1997	SUMMER	1	20.00	20.000	20.00	.	.	.	20.00	20.00	20.00	20.00	20.00
80	1990	FALL	1	70.00	70.000	70.00	.	.	.	70.00	70.00	70.00	70.00	70.00
80	1990	SPRING	1	100.00	100.00	100.00	.	.	.	100.00	100.00	100.00	100.00	100.00
80	1990	SUMMER	2	72.50	60.000	85.00	17.68	12.50	24	60.00	60.00	72.50	85.00	85.00
80	1991	FALL	1	115.00	115.00	115.00	.	.	.	115.00	115.00	115.00	115.00	115.00
80	1991	SUMMER	2	50.00	20.000	80.00	42.43	30.00	85	20.00	20.00	50.00	80.00	80.00

Lakes and Reservoirs
Descriptive Statistics by Subecoregion, Year and Season
from 1990 to 1999
Total_Phosphorus_ug_L

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
80	1992	FALL	1	95.00	95.000	95.00	.	.	.	95.00	95.00	95.00	95.00	95.00
80	1992	SPRING	1	90.00	90.000	90.00	.	.	.	90.00	90.00	90.00	90.00	90.00
80	1992	SUMMER	2	60.00	50.000	70.00	14.14	10.00	24	50.00	50.00	60.00	70.00	70.00
80	1992	WINTER	1	140.00	140.00	140.00	.	.	.	140.00	140.00	140.00	140.00	140.00
80	1993	FALL	1	80.00	80.000	80.00	.	.	.	80.00	80.00	80.00	80.00	80.00
80	1993	SPRING	1	120.00	120.00	120.00	.	.	.	120.00	120.00	120.00	120.00	120.00
80	1993	SUMMER	2	110.00	70.000	150.00	56.57	40.00	51	70.00	70.00	110.00	150.00	150.00
80	1993	WINTER	1	115.00	115.00	115.00	.	.	.	115.00	115.00	115.00	115.00	115.00
80	1994	FALL	1	95.00	95.000	95.00	.	.	.	95.00	95.00	95.00	95.00	95.00
80	1994	SPRING	1	90.00	90.000	90.00	.	.	.	90.00	90.00	90.00	90.00	90.00
80	1994	WINTER	1	80.00	80.000	80.00	.	.	.	80.00	80.00	80.00	80.00	80.00
80	1995	FALL	1	85.00	85.000	85.00	.	.	.	85.00	85.00	85.00	85.00	85.00
80	1995	SPRING	1	85.00	85.000	85.00	.	.	.	85.00	85.00	85.00	85.00	85.00
80	1995	SUMMER	3	71.67	55.000	90.00	17.56	10.14	25	55.00	55.00	70.00	90.00	90.00
80	1995	WINTER	1	100.00	100.00	100.00	.	.	.	100.00	100.00	100.00	100.00	100.00
80	1996	FALL	1	80.00	80.000	80.00	.	.	.	80.00	80.00	80.00	80.00	80.00
80	1996	SPRING	1	80.00	80.000	80.00	.	.	.	80.00	80.00	80.00	80.00	80.00
80	1996	SUMMER	2	100.00	60.000	140.00	56.57	40.00	57	60.00	60.00	100.00	140.00	140.00
80	1996	WINTER	1	90.00	90.000	90.00	.	.	.	90.00	90.00	90.00	90.00	90.00
80	1997	FALL	1	65.00	65.000	65.00	.	.	.	65.00	65.00	65.00	65.00	65.00
80	1997	SPRING	1	70.00	70.000	70.00	.	.	.	70.00	70.00	70.00	70.00	70.00
80	1997	SUMMER	2	70.00	60.000	80.00	14.14	10.00	20	60.00	60.00	70.00	80.00	80.00
80	1997	WINTER	1	90.00	90.000	90.00	.	.	.	90.00	90.00	90.00	90.00	90.00
80	1998	SUMMER	1	130.00	130.00	130.00	.	.	.	130.00	130.00	130.00	130.00	130.00
80	1998	WINTER	1	80.00	80.000	80.00	.	.	.	80.00	80.00	80.00	80.00	80.00
81	1990	FALL	1	30.00	30.000	30.00	.	.	.	30.00	30.00	30.00	30.00	30.00
81	1991	FALL	1	10.00	10.000	10.00	.	.	.	10.00	10.00	10.00	10.00	10.00

Aggregate Nutrient Ecoregion: III
Lakes and Reservoirs
Descriptive Statistics by Subecoregion, Year and Season
from 1991 to 1999
pH_S_U

subecoregion	year	season	N	MEAN	MIN	MAX	STDDEV	STDERR	CV	P5	P25	MEDIAN	P75	P95
10	1994	FALL	3	8.27	8.1000	8.50	0.21	0.12	3	8.10	8.10	8.20	8.50	8.50
10	1994	SPRING	3	8.53	8.5000	8.55	0.03	0.02	0	8.50	8.50	8.55	8.55	8.55
10	1994	SUMMER	3	8.20	8.2000	8.20	0.00	0.00	0	8.20	8.20	8.20	8.20	8.20
10	1994	WINTER	3	8.10	8.0000	8.20	0.10	0.06	1	8.00	8.00	8.10	8.20	8.20
10	1995	FALL	3	8.25	8.1500	8.30	0.09	0.05	1	8.15	8.15	8.30	8.30	8.30
10	1995	SPRING	3	7.98	7.9500	8.00	0.03	0.02	0	7.95	7.95	8.00	8.00	8.00
10	1995	SUMMER	3	7.85	7.8000	7.90	0.05	0.03	1	7.80	7.80	7.85	7.90	7.90
10	1995	WINTER	3	8.02	8.0000	8.05	0.03	0.02	0	8.00	8.00	8.00	8.05	8.05
10	1998	FALL	5	8.51	8.0000	9.05	0.40	0.18	5	8.00	8.35	8.40	8.75	9.05
10	1998	SUMMER	6	8.58	7.2750	9.30	0.74	0.30	9	7.28	8.30	8.70	9.20	9.30
10	1998	WINTER	3	8.13	8.0000	8.30	0.15	0.09	2	8.00	8.00	8.10	8.30	8.30
10	1999	SPRING	5	8.45	8.1000	8.70	0.22	0.10	3	8.10	8.40	8.50	8.55	8.70
10	1999	WINTER	4	8.33	8.2000	8.60	0.19	0.09	2	8.20	8.20	8.25	8.45	8.60
12	1991	FALL	2	8.18	8.1700	8.18	0.01	0.00	0	8.17	8.17	8.18	8.18	8.18
12	1991	SPRING	2	8.04	7.9400	8.13	0.13	0.10	2	7.94	7.94	8.04	8.13	8.13
12	1991	SUMMER	2	8.12	8.1000	8.14	0.03	0.02	0	8.10	8.10	8.12	8.14	8.14
12	1991	WINTER	2	8.09	7.9650	8.21	0.17	0.12	2	7.97	7.97	8.09	8.21	8.21
12	1992	WINTER	2	8.16	8.1550	8.17	0.01	0.01	0	8.16	8.16	8.16	8.17	8.17
12	1997	SUMMER	3	8.86	8.5850	9.38	0.45	0.26	5	8.59	8.59	8.61	9.38	9.38
12	1998	SUMMER	8	8.34	7.8350	9.58	0.55	0.20	7	7.84	7.98	8.22	8.47	9.58
13	1997	SUMMER	3	8.26	8.2400	8.30	0.03	0.02	0	8.24	8.24	8.24	8.30	8.30
13	1998	SUMMER	1	8.51	8.5100	8.51	.	.	.	8.51	8.51	8.51	8.51	8.51
18	1997	SUMMER	1	7.91	7.9100	7.91	.	.	.	7.91	7.91	7.91	7.91	7.91
18	1998	SUMMER	1	7.32	7.3150	7.32	.	.	.	7.32	7.32	7.32	7.32	7.32
20	1999	SUMMER	2	8.25	8.1050	8.40	0.21	0.15	3	8.11	8.11	8.25	8.40	8.40
22	1999	SUMMER	2	8.22	8.0500	8.39	0.24	0.17	3	8.05	8.05	8.22	8.39	8.39
80	1991	SUMMER	1	6.30	6.3000	6.30	.	.	.	6.30	6.30	6.30	6.30	6.30
80	1997	SUMMER	1	7.88	7.8800	7.88	.	.	.	7.88	7.88	7.88	7.88	7.88
80	1998	SUMMER	1	7.48	7.4800	7.48	.	.	.	7.48	7.48	7.48	7.48	7.48

APPENDIX C

Quality Control/Quality Assurance Rules

Continued Support for the Compilation and Analysis of National Nutrient Data

9 Nutrient Ecoregion/Waterbody Type Summary Chapters

Prepared for:

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Contract Number:68-C-99-226
Task Number:07
Subtask Number:4

August 27, 2001

CONTENTS

1.0 BACKGROUND

The Nutrient Criteria Program initiated the development of a national Nutrient Criteria Database application that is used to store and analyze nutrient data. The ultimate use of these data is to derive ecoregion specific nutrient criteria. EPA converted STOrage and RETrieval (STORET) legacy data, National Stream Quality Accounting Network (NASQAN) data, National Water-Quality Assessment (NAWQA) data, and other relevant nutrient data from universities and States/Tribes into the database. The data imported into the Nutrient Criteria Database are used to develop national nutrient criteria recommendations.

1.1 Purpose

The purpose of this deliverable is to provide EPA with information regarding the database used to create the statistical reports which will be used to derive ecoregion-specific nutrient criteria for Level III ecoregions. There are fourteen aggregate nutrient ecoregions. Each aggregate nutrient ecoregion is divided into smaller ecoregions (subecoregions) referred to as Level III ecoregions. EPA will determine criteria for the waterbody types and Level III ecoregions within the following aggregate nutrient ecoregions:

- Lakes and Reservoirs
  - Aggregate Nutrient ecoregions: 3, 4, 5, and 14

- Rivers and Streams
  - Aggregate Nutrient ecoregions: 1, 4, 5, 8, and 10

1.2 References

This section lists documents that contain baselines, standards, guidelines, policies, and references that apply to the data analysis. Listed editions were valid at the time of publication. All documents are subject to revision, but these specific editions govern the concepts described in this document.

Nutrient Criteria Technical Guidance Document: Lakes and Reservoirs (Draft). EPA, Office of Water, EPA 822-D-99-001, April 1999.

Nutrient Criteria Technical Guidance Manual: Rivers and Streams (Draft). EPA, Office of Water, EPA 822-D-99-003, September 1999.

Guidance for Data Quality Assessment: Practical Methods for Data Analysis. EPA, Office of Research and Development, EPA QA/G-9, January 1998.

2.0 QA/QC PROCEDURES

In order to develop nutrient criteria, EPA needed to obtain nutrient data from the states. EPA requested nutrient data from the states and forwarded the data sets to INDUS via e-mail and/or US mail. In addition, EPA tasked INDUS to convert data from three national data sets. EPA provided INDUS with a Legacy STORET extraction to convert into the database. The United States Geologic Survey (USGS) sent INDUS a CD-ROM with NASQAN data to convert. INDUS downloaded NAWQA files from the USGS Web site to convert the data. In total, INDUS converted and imported the following national and state data sets into the Nutrient Criteria Database:

- Legacy STORET
- NAWQA
- NASQAN
- EPA Region 1
- EPA Region 2 - Lake Champlain Monitoring Project
- EPA Region 2 - NYSDEC Finger Lakes Monitoring Program
- EPA Region 2 - NY Citizens Lake Assessment Program
- EPA Region 2 - Lake Classification and Inventory Survey
- EPA Region 2 - NYCDEP (1990-1998)
- EPA Region 2 - NYCDEP (Storm Event data)
- EPA Region 2 - New Jersey Nutrient Data (Tidal Waters)
- EPA Region 5
- EPA Region 3
- EPA Region 3 - Nitrite Data
- EPA Region 3 - Choptank River files
- EPA Region 4 - Tennessee Valley Authority
- EPA Region 7 - Central Plains Center for BioAssessment (CPCB)
- EPA Region 7 - REMAP
- EPA Region 2 - Delaware River Basin Commission (1990-1998)
- EPA Region 3 - PA Lake Data
- EPA Region 3 - University of Delaware
- EPA Region 10
- University of Auburn
- EPA Region 8 - MT and WY
- EPA Region 9
- Suffolk County
- NYCDEC
- NY Lakes Morphometry
- EPA Region 8 - South Dakota
- EPA Region 8 - Colorado Reservoir
- EPA Region 4
- EPA Region 10 - Lake Data
- EPA Region 7 - Central Plains Center for BioAssessment (CPCB) 2
- EPA Region 8 - North Dakota
- EPA Region 8 - Eagle River
- EPA Region 8 - Utah
- Florida

As part of the conversion process, INDUS performed a number of Quality Assurance/Quality Control (QA/QC) steps to ensure that the data were properly converted into the Nutrient Criteria Database. Sections 2.1 and 2.2 explain the steps performed by INDUS to convert the data.

2.1 National Data Sets

INDUS converted three national data sets into the Nutrient Criteria Database: Legacy STORET data, NASQAN data, and NAWQA data. A previous EPA contractor performed the extraction of Legacy STORET data and documented the QA/QC procedures used on the data. This documentation is included in Appendix A. INDUS performed minimal QA/QC on the Legacy STORET data set because the previous contractor completed the steps outlined in Appendix A. INDUS and EPA also agreed to convert the NAWQA and NASQAN data sets with minimal QA/QC on the assumption that the source agency, the USGS, QA/QC'd the data.

For each of the three national data sets, INDUS ran queries to determine if 1) samples existed without results and 2) if stations existed without samples. Per Task Order Project Officer (TOPO) direction, these records were deleted from the system. For analysis purposes, EPA determined that there was no need to keep station records with no samples and sample records with no results. INDUS also confirmed that each data set contained no duplicate records.

In addition, INDUS deleted all composite results from the Legacy STORET data. Per TOPO direction, it was decided that composite sample results would not be used in the statistical analysis.

2.2 State Data

Each state data set was delivered in a unique format. Many of the data sets were delivered to INDUS without corresponding documentation. INDUS analyzed each state data set in order to determine which parameters should be converted for analysis. INDUS obtained a master parameter table from EPA and converted the parameters in the state data sets according to those that were present in the EPA parameter table. INDUS converted all of the data elements in the state data sets that mapped directly to the Nutrient Criteria Database; data elements that did not map to the Nutrient Criteria Database were not converted. In some cases, state data elements that did not directly map into the Oracle database were inserted into a comment field within the database. Also, INDUS maintained an internal record of which state data elements were inserted into the comment field.

As part of the data clean-up efforts, INDUS determined whether or not there were any duplicate records in the state data sets and deleted the duplicate records. INDUS checked the waterbody, station, and sample entities for duplicate records. However, if there was not enough information provided to determine duplicates such as sampling date, there was no way for INDUS to locate duplicate records. In addition, INDUS deleted station records with no samples and sample records with no results. INDUS also deleted waterbody records that were not associated with a station. In each case, INDUS maintained an internal record of how many records were deleted.

If INDUS encountered referential integrity errors, such as samples that referred to stations that did not exist, or if INDUS was unsure of whether a record was a duplicate, INDUS contacted the agency directly via e-mail or phone to resolve any issues that arose. INDUS saved an electronic copy of each e-mail correspondence with the states to ensure that a record of the decision was maintained.

Finally, INDUS examined the remark codes of each result record in the state data sets. INDUS mapped the remark codes to the STORET remark codes listed in Table 2 of Appendix A. If any of the state result records were associated with remark codes marked as "Delete" in Table 2 of Appendix A, the result records were not converted into the database.

2.3 Laboratory Methods

Many of the state data sets did not contain laboratory method information. In addition, laboratory method information was not available for the three national data sets. In order to determine missing laboratory method information, EPA tasked another contractor to contact the data owners to obtain the laboratory method. In some cases, the data owners responded and the laboratory methods were added to the database. In other cases, the methods are unknown.

2.4 Waterbody Name and Class Information

A large percentage of the data did not have waterbody-specific information. The only waterbody information contained in the three national data sets was the waterbody name, which was embedded in the station 'location description' field. Most of the state data sets contained waterbody name information; however, much of the data were duplicated throughout the data sets. Therefore, the waterbody information was cleaned manually. For the three national data sets, the 'location description' field was extracted from the station table and moved to a temporary table. The 'location description' field was sorted alphabetically. Unique waterbodies were grouped together based on name similarity and whether or not the waterbodies fell within the same county, state, and waterbody type. Finally, the 'location description' field was edited to include only waterbody name information, not descriptive information. For example, 110 MILE CREEK AT POMONA DAM OUTFLOW, KS PO-2 was edited to 110 MILE CREEK. Also, if 100 MILE CREEK was listed ten times in New York, but in four different counties, four 100 MILE CREEK waterbody records were created.

Similar steps were taken to eliminate duplicate waterbody records in the state data sets. If a number of records had similar waterbody names and fell within the same state, county, and waterbody type, the records were grouped to create a unique waterbody record.

Most of the waterbody data did not contain depth, surface area, and volume measurements. EPA needed this information to classify waterbody types. EPA attempted to obtain waterbody class information from the states. EPA sent waterbody files to the regional coordinators and requested that certain class information be completed by each state. The state response was poor; therefore, EPA was not able to perform statistical analysis for the waterbody types by class.

2.5 Ecoregion Data

Aggregate nutrient ecoregions and Level III ecoregions were added to the database using the station latitude and longitude coordinates, the county centroid, or HUC (Hydrological Unit Code) centroid. If a station was lacking latitude and longitude coordinates and county information, the data were not included in the statistical analysis. Appendix B lists the steps taken to add the two ecoregion types (aggregate and Level III) to the Nutrient Criteria Database. The ecoregion names were pulled from aggregate nutrient ecoregion and Level III ecoregion Geographical Information System (GIS) coverages. In summary, the station latitude and longitude coordinates were used to determine the ecoregion under the following circumstances:

- The latitude and longitude coordinates fell within the county/state listed in the station table.
- The county data were missing.

The county centroid was used to determine the ecoregions under the following circumstances:

- The latitude and longitude coordinates were missing, but the state/county information was available.
- The latitude and longitude coordinates fell outside the county/state/HUC listed in the station table. The county information was assumed to be correct; therefore, the county centroid was used.

The HUC centroid was used to determine the ecoregions under the following circumstances:

- The latitude and longitude coordinates and county were missing, but the HUC information was available.

If the latitude and longitude coordinates fell outside the continental US county coverage file (i.e., the point fell in the ocean or Mexico/Canada), the nearest ecoregion was assigned to the station.

3.0 STATISTICAL ANALYSIS REPORTS

Aggregate nutrient ecoregion tables were created by extracting all observations for a specific aggregate nutrient ecoregion from the Nutrient Criteria Database. Then, the data were reduced to create tables containing only the yearly median values. To create these tables, the median value for each waterbody was calculated using all observations for each waterbody by Level III ecoregion, state, county, year, and season. Tables of decade median values were created from the yearly median tables by calculating the median for each waterbody by Level III ecoregion, state, county, decade and season.

The Data Source and the Remark Code reports were created using all observations (all reported values). All the other reports were created from either the yearly median tables or the decade median tables. In other words, the descriptive statistics and regressions were run using the median values for each waterbody and not the individual reported values.

Statistical analyses were performed under the assumption that this data set is a random sample. If this assumption cannot be verified, the observations may or may not be valid. Values below the 1st and 99th percentile were removed from the Legacy STORET database prior to the creation of the national database. Also, data were treated according to the Legacy STORET remark codes in Appendix A.

The following contains a list of each report and the purpose for creating each report:

- Data Source—Created to provide a count of the amount of data and to identify the source(s).
- Remark Codes—Created to provide a description of the data.
- Median of Each Waterbody by Year—This was an intermediate step performed to obtain a median value for each waterbody to be used in the yearly descriptive statistics reports and the regression models.
- Median of Each Waterbody by Decade—This was an intermediate step performed to obtain a median value for each waterbody to be used in the decade descriptive statistics.
- Descriptive Statistics—Created to provide EPA with the desired statistics for setting criteria levels.
- Regression Models—Created to examine the relationships between biological and nutrient variables.

Note: Separate reports were created for each season.

3.1 Data Source Reports

Data source reports were presented in the following formats:

- The number and percentage of data from each data source were summarized in tables for each aggregate nutrient ecoregion by season and waterbody type.

- The number and percentage of data from each data source were summarized in tables for each aggregate nutrient ecoregion for all seasons and waterbody type.

- The number and percentage of data from each data source were summarized in tables for each Level III ecoregion by season and waterbody type.

The ‘Frequency’ represents the number of data values from a specific data source for each parameter by data source. The ‘Row Pct’ represents the percentage of data from a specific data source for each parameter.

3.2 Remark Code Reports

Remark code reports were presented in the following formats:

- The number and percentage of data associated with a particular remark code for each parameter were summarized in tables by Level III ecoregion by decade and season.

- The number and percentage of data associated with a particular remark code for each parameter were summarized in tables by Level III ecoregion by year and season.

The 'Frequency' represents the number of data values corresponding to the remark code in the column. The 'Row Pct' represents the percentage of data that was associated with the remark code in that row.

In the database, remark codes that were entered by the states were mapped to Legacy STORET remark codes. Prior to the analysis, the data were treated according to these remark codes. For example, if the remark code was 'K,' then the reported value was divided by two. Appendix A contains a complete list of Legacy STORET remark codes.

Note: For the reports, a remark code of 'Z' indicates that no remark codes were recorded. It does not correspond to Legacy STORET code 'Z.'

3.3 Median of Each Waterbody

To reduce the data and to ensure heavily sampled waterbodies or years were not over represented in the analysis, median value tables (described above) were created. The yearly median tables and decade median tables were delivered to the EPA in electronic format as csv (comma separated value or comma delimited) files.

3.4 Descriptive Statistic Reports

The number of waterbodies, median, mean, minimum, maximum, 5^{th}, 25^{th} , 75^{th} , 95^{th} percentiles, standard deviation, standard error, and coefficient of variation were calculated. The tables (described above) containing the decade median values for each waterbody for each parameter were used to create descriptive statistics reports for:

- Level III ecoregions by decade and season
- Aggregate nutrient ecoregions by decade and season

In addition, the tables containing the yearly median values for each waterbody for each parameter were used to create descriptive statistics reports for:

- Level III ecoregions by year and season

3.5 Regression Models

Simple linear regressions using the least squares method were performed to examine the relationships between biological and nutrient variables in lakes and reservoirs, and rivers and streams. Regressions were performed using the yearly median tables. Chlorophyll(s) in micrograms per liter (ug/L), Secchi in meters (m), Dissolved Oxygen in milligrams per liter (mg/L), Turbidity, and pH were the biological variables in these models. Secchi data were used in the lake and reservoir models, and Turbidity data were used in the river and stream models.

The nutrient variables in these models include: Total Phosphorus in ug/L, Total Nitrogen in mg/L, Total Kjeldahl Nitrogen in mg/L, and Nitrate and Nitrite in mg/L.

4.0 TIME PERIOD

Data collected from January 1990 to December 2000 were used in the statistical analysis reports. To capture seasonal differences, the data were classified as follows:

- Aggregate nutrient ecoregions: 6, 7, and 8
  - Spring: April to May
  - Summer: June to August
  - Fall: September to October
  - Winter: November to March
- Aggregate nutrient ecoregions: 1, 2, 3, 4, 5, 9, 10, 11, 12, 13, and 14
  - Spring: March to May
  - Summer: June to August
  - Fall: September to November
  - Winter: December to February

5.0 DATA SOURCES AND PARAMETERS FOR THE AGGREGATE NUTRIENT ECOREGIONS

This section provides information for the nutrient aggregate ecoregions that were analyzed by waterbody type. Each section lists the data sources for the aggregate nutrient ecoregion including: 1) the data sources, 2) the parameters included in the analysis, and 3) the Level III ecoregions within the aggregate nutrient ecoregions.

Note: For analysis purposes, data for the following parameters were grouped together and reported under Phosphorous, Dissolved Inorganic (DIP):

Phosphorus, Dissolved Inorganic (DIP)
Phosphorus, Dissolved (DP)
Phosphorus, Dissolved Reactive (DRP)
Orthophosphate, dissolved, mg/L as P
Orthophosphate (OPO4_PO4)

5.1 Lakes and Reservoirs

5.1.1 Aggregate Nutrient Ecoregion 3

Data Sources:

Legacy STORET
EPA Region 10
EPA Region 8 - Colorado Reservoir

Parameters:

Chlorophyll A, Fluorometric, corrected (ug/L)
Chlorophyll A, Phytoplankton, spectrophotometric Acid (ug/L)
Chlorophyll A, Trichromatic, uncorrected (ug/L)
Dissolved Inorganic Phosphorus (DIP) (ug/L)
Dissolved Oxygen (DO) (mg/L)
Nitrite and Nitrate, (NO2+NO3) (mg/L)
Nitrogen, Total (TN) (mg/L)
Nitrogen, Total Kjeldhal (TKN) (mg/L)
Phosphorus, Total (TP) (ug/L)
SECCHI (m)
pH

Level III ecoregions:

6, 10, 12, 13, 18, 20, 22, 24, 80, 81

5.1.2 Aggregate Nutrient Ecoregion 4

Data Sources:

Legacy STORET
EPA Region 8 - MT and WY
EPA Region 8 - South Dakota
EPA Region 8 - North Dakota

Parameters:

Chlorophyll A, Phytoplankton, spectrophotometric Acid (ug/L)
Chlorophyll A, Trichromatic, uncorrected (ug/L)
Dissolved Inorganic Phosphorus (DIP) (ug/L)
Dissolved Oxygen (DO) (% Saturated)
Dissolved Oxygen (DO) (mg/L)
Nitrite and Nitrate, (NO2+NO3) (mg/L)
Nitrogen, Total (TN) (mg/L)

Nitrogen, Total Kjeldhal (TKN) (mg/L)
Phosphorus, Total (TP) (ug/L)
SECCHI (m)
pH

Level III ecoregions:

26, 28, 30, 31, 43, 44

5.1.3 Aggregate Nutrient Ecoregion 5

Data sources:

Legacy STORET
EPA Region 8 - MT and WY
EPA Region 8 - South Dakota
EPA Region 8 - North Dakota

Parameters:

Chlorophyll A, Phytoplankton, spectrophotometric Acid (ug/L)
Chlorophyll A, Trichromatic, uncorrected (ug/L)
Dissolved Inorganic Phosphorus (DIP) (ug/L)
Dissolved Oxygen (DO) (% Saturated)
Dissolved Oxygen (DO) (mg/L)
Nitrite and Nitrate, (NO2+NO3) (mg/L)
Nitrogen, Total (TN) (mg/L)
Nitrogen, Total Kjeldhal (TKN) (mg/L)
Phosphorus, Total (TP) (ug/L)
SECCHI (m)
pH

Level III ecoregions:

25, 27, 32, 42

5.1.4 Aggregate Nutrient Ecoregion 14

Data sources:

Legacy STORET
Region 2 - NY Citizens Lake Assessment Program
Region 2 - NYCDEP (1990-1998)
EPA Region 1

Parameters:

CHLB (ug/L)
CHLC (ug/L)
Chlorophyll A, Fluorometric, corrected (ug/L)
Chlorophyll A, Phytoplankton, spectrophotometric Acid (ug/L)
Chlorophyll A, Phytoplankton, spectrophotometric, uncorrected (ug/L)
Chlorophyll A, Trichromatic, uncorrected (ug/L)
Dissolved Inorganic Phosphorus (DIP) (ug/L)
Dissolved Oxygen (DO) (mg/L)
Nitrite and Nitrate, (NO2+NO3) (mg/L)
Nitrogen, Total (TN) (mg/L)
Nitrogen, Total Kjeldhal (TKN) (mg/L)
Phosphorus, Total (TP) (ug/L)
SECCHI (m)
pH

Level III ecoregions:

59, 63, 84

5.2 Rivers and Streams

5.2.1 Aggregate Nutrient Ecoregion 1

Data sources:

Legacy STORET
NASQAN
NAWQA
EPA Region 10

Parameters:

Chlorophyll A, Fluorometric, corrected (ug/L)
Chlorophyll A, Periphyton, spectrophotometric, uncorrected (mg/sqm)
Chlorophyll A, Phytoplankton, spectrophotometric Acid (ug/L)
Chlorophyll A, Trichromatic, uncorrected (ug/L)
Dissolved Inorganic Phosphorus (DIP) (ug/L)
Dissolved Oxygen (DO) (mg/L)
Nitrite and Nitrate, (NO2+NO3) (mg/L)
Nitrogen, Total (TN) (mg/L)
Nitrogen, Total Kjeldhal (TKN) (mg/L)
Phosphorus, Total (TP) (ug/L)
Phosphorus, orthophosphate, total, as P(ug/L)
Turbidity (FTU)

Turbidity (NTU)
Turbidity (JCU)
pH

Level III ecoregions:

3, 7

5.2.2 Aggregate Nutrient Ecoregion 4

Data sources:

Legacy STORET
NASQAN
NAWQA
EPA Region 7 - Central Plains Center for BioAssessment (CPCB)
EPA Region 7 - Central Plains Center for BioAssessment (CPCB) 2
EPA Region 7 - REMAP
EPA Region 8 - MT and WY
EPA Region 8 - South Dakota
EPA Region 8 - North Dakota

Parameters:

Chlorophyll A, Fluorometric, corrected (ug/L)
Chlorophyll A, Pheophytin, corrected (ug/L)
Chlorophyll A, Phytoplankton, spectrophotometric Acid (ug/L)
Dissolved Inorganic Phosphorus (DIP) (ug/L)
Dissolved Oxygen (DO) (% Saturated)
Dissolved Oxygen (DO) (mg/L)
Nitrite and Nitrate, (NO2+NO3) (mg/L)
Nitrogen, Total (TN) (mg/L)
Nitrogen, Total Kjeldhal (TKN) (mg/L)
Organic_P (ug/L)
Phosphorus, Total (TP) (ug/L)
Phosphorus, orthophosphate, total, as P(ug/L)
Turbidity (FTU)
Turbidity (NTU)
Turbidity (JCU)
pH

Level III ecoregions:

26, 28, 30, 31, 43, 44

5.2.3 Aggregate Nutrient Ecoregion 5

Data sources:

Legacy STORET
NASQAN
NAWQA
EPA Region 7 - Central Plains Center for BioAssessment (CPCB)
EPA Region 7 - Central Plains Center for BioAssessment (CPCB) 2
EPA Region 7 - REMAP
EPA Region 8 - MT and WY
EPA Region 8 - South Dakota
EPA Region 8 - North Dakota

Parameters:

Chlorophyll A, Fluorometric, corrected (ug/L)
Chlorophyll A, Pheophytin, corrected (ug/L)
Chlorophyll A, Phytoplankton, spectrophotometric Acid (ug/L)
Dissolved Inorganic Phosphorus (DIP) (ug/L)
Dissolved Oxygen (DO) (% Saturated)
Dissolved Oxygen (DO) (mg/L)
Nitrite and Nitrate, (NO2+NO3) (mg/L)
Nitrogen, Total (TN) (mg/L)
Nitrogen, Total Kjeldhal (TKN) (mg/L)
Organic_P (ug/L)
Phosphorus, Total (TP) (ug/L)
Phosphorus, orthophosphate, total, as P (ug/L)
Turbidity (FTU)
Turbidity (NTU)
Turbidity (JCU)
pH

Level III ecoregions:

25, 27, 32, 42

5.2.4 Aggregate Nutrient Ecoregion 8

Data sources:

Legacy STORET
NASQAN
NAWQA
EPA Region 2 - NYCDEP (1990-1998)
EPA Region 1

EPA Region 3
EPA Region 5

Parameters:

Chlorophyll A, Fluorometric, corrected (ug/L)
Chlorophyll A, Phytoplankton, spectrophotometric Acid (ug/L)
Chlorophyll A, Phytoplankton, spectrophotometric, uncorrected (ug/L)
Chlorophyll A, Trichromatic, uncorrected (ug/L)
Dissolved Inorganic Phosphorus (DIP) (ug/L)
Dissolved Oxygen (DO) (% Saturated)
Dissolved Oxygen (DO) (mg/L)
Nitrite and Nitrate, (NO2+NO3) (mg/L)
Nitrogen, Total (TN) (mg/L)
Nitrogen, Total Kjeldhal (TKN) (mg/L)
Phosphorus, Total (TP) (ug/L)
Phosphorus, orthophosphate, total, as P (ug/L)
Turbidity (FTU)
Turbidity (NTU)
pH

Level III ecoregions:

49, 50, 58, 62, 82

5.2.5 Aggregate Nutrient Ecoregion 10

Data sources:

Legacy STORET
NASQAN
EPA Region 7 - Central Plains Center for BioAssessment (CPCB)
EPA Region 7 - Central Plains Center for BioAssessment (CPCB) 2
EPA Region 7 - REMAP

Parameters:
Chlorophyll A, Fluorometric, corrected (ug/L)
Chlorophyll A, Pheophytin, corrected (ug/L)
Chlorophyll A, Phytoplankton, chromotographic- fluorometric (ug/L)
Chlorophyll A, Phytoplankton, spectrophotometric Acid (ug/L)
Chlorophyll A, Trichromatic, uncorrected (ug/L)
Chlorophyll B, Phytoplankton, chromotographic- fluorometric (ug/L)
Dissolved Inorganic Phosphorus (DIP) (ug/L)
Dissolved Oxygen (DO) (mg/L)
Nitrite and Nitrate, (NO2+NO3) (mg/L)
Nitrogen, Total (TN) (mg/L)

Nitrogen, Total Kjeldhal (TKN) (mg/L)
Organic_P (ug/L)
Phosphorus, Total (TP) (ug/L)
Phosphorus, orthophosphate, total, as P(ug/L)
Turbidity (FTU)
Turbidity (NTU)
Turbidity (JCU)
pH

<u>Level III ecoregions:</u>

34, 73

APPENDIX A. Process Used to QA/QC the Legacy STORET Nutrient Data Set

1. STORET water quality parameters and Station and Sample data items were retrieved from USEPA's mainframe computer. Table 1 lists all retrieved parameters and data items.

TABLE 1: PARAMETERS AND DATA ITEMS RETRIEVED FROM STORET

Parameters Retrieved (STORET Parameter Code)	Station Data Items Included (STORET Item Name)	Sample Data Items Included (STORET Item Name)
TN - mg/l (600) TKN - mg/l (625) Total Ammonia (NH3+NH4) - mg/l (610) Total NO2+NO3 - mg/l (630) Total Nitrite - mg/l (615) Total Nitrate - mg/l (620) Organic N - mg/L (605) TP - mg/l (665) Chlor *a* - ug/L (spectrophotometric method, 32211) Chlor *a* - ug/L (fluorometric method corrected, 32209) Chlor *a* - ug/L (trichromatic method corrected, 32210) Secchi Transp. - inches (77) Secchi Transp. - meters (78) +Turbidity JCUs (70) +Turbidity FTUs (76) +Turbidity NTUs field (82078) +Turbidity NTUs lab (82079) +DO - mg/L (300) +Water Temperature (degrees C, 10/degrees F, 11)	Station Type (TYPE) Agency Code (AGENCY) Station No. (STATION) Latitude - std. decimal degrees (LATSTD) Longitude - std. decimal degrees (LONGSTD) Station Location (LOCNAME) County Name (CONAME) State Name (STNAME) Ecoregion Name - Level III (ECONAME) Ecoregion Code -Level III (ECOREG) Station Elevation (ELEV) Hydrologic Unit Code (CATUNIT) RF1 Segment and Mile (RCHMIL) RF1ON/OFF tag (ONOFF)	Sample Date (DATE) Sample Time (TIME) Sample Depth (DEPTH) Composite Sample Code (SAMPMETH)
+ If data record available at a station included data only for this or other such marked parameters, data record was deleted from data set.		

The following set of retrieval rules were applied to the retrieval process:

- Data were retrieved for waterbodies specified only as **'lake', 'stream', 'reservoir', or 'estuary'** under "Station Type" parameter**.** Any stations specified as 'well,' 'spring,' or 'outfall' were eliminated from the retrieved data set.
- Data were retrieved for station types described as 'ambient' (e.g., no pipe or facility discharge data) under the "Station Type" parameter.
- Data were retrieved that were designated as 'water' samples only. This includes 'bottom' and 'vertically integrated' water samples.
- Data were retrieved that were designated as either 'grab' samples and 'composite' samples (mean result only).

- No limits were specified for sample depths.
- Data were retrieved for all fifty states, Puerto Rico, and the District of Columbia.
- The time period specified for data retrieval was January 1990 to September 1998.
- No data marked as "Retired Data" (i.e., data from a generally unknown source) were retrieved.
- Data marked as "National Urban Runoff data" (i.e., data associated with sampling conducted after storm events to assess nonpoint source pollutants) were included in the retrieval. Such data are part of STORET's 'Archived' data.
- Intensive survey data (i.e., data collected as part of specific studies) were retrieved.

2. Any values falling below the 1st percentile and any values falling above the 99th percentile were transformed into 'missing' values (i.e., values were effectively removed from the data set, but were not permanently eliminated).

3. Based on the STORET 'Remark Code' associated with each retrieved data point, the following rules were applied (Table 2):

TABLE 2: STORET REMARK CODE RULES

STORET Remark Code	Keep or Delete Data Point
blank - Data not remarked.	Keep
A - Value reported is the mean of two or more determinations.	Keep
B - Results based upon colony counts outside the acceptable ranges.	Delete
C -Calculated. Value stored was not measured directly, but was calculated from other data available.	Keep
D - Field measurement.	Keep
E - Extra sample taken in compositing process.	Delete
F - In the case of species, F indicates female sex.	Delete
G - Value reported is the maximum of two or more determinations.	Delete
H - Value based on field kit determination; results may not be accurate.	Delete
I - The value reported is less than the practical quantification limit and greater than or equal to the method detection limit.	Keep, but used one-half the reported value as the new value.
J - Estimated. Value shown is not a result of analytical measurement.	Delete

TABLE 2: STORET REMARK CODE RULES	
K - Off-scale low. Actual value not known, but known to be less than value shown.	Keep, but used one-half the reported value as the new value.
L - Off-scale high. Actual value not known, but known to be greater than value shown.	Keep
M -Presence of material verified, but not quantified. Indicates a positive detection, at a level too low to permit accurate quantification.	Keep, but used one half the reported value as the new value.
N -Presumptive evidence of presence of material.	Delete
O -Sample for, but analysis lost. Accompanying value is not meaningful for analysis.	Delete
P -Too numerous to count.	Delete
Q -Sample held beyond normal holding time.	Delete
R -Significant rain in the past 48 hours.	Delete
S -Laboratory test.	Keep
T -Value reported is less than the criteria of detection.	Keep, but replaced reported value with 0.
U -Material was analyzed for, but not detected. Value stored is the limit of detection for the process in use.	Keep, but replaced reported value with 0.
V -Indicates the analyte was detected in both the sample and associated method blank.	Delete
W -Value observed is less than the lowest value reportable under remark "T."	Keep, but replaced reported value with 0.
X -Value is quasi vertically-integrated sample.	No data point with this remark code in data set.
Y -Laboratory analysis from unpreserved sample. Data may not be accurate.	Delete
Z -Too many colonies were present to count.	Delete
If a parameter (excluding water temperature) value was less than or equal to zero and no remark code was present, the value was transformed into a missing value. Rationale - Parameter concentrations should never be zero without a proper explanation. A method detection limit should at least be listed	

4. Station records were eliminated from the data set if any of the following descriptors were present within the "Station Type" parameter:

- **MONITR -** Source monitoring site, which monitors a known problem or to detect a specific problem.
- **HAZARD -** Site of hazardous or toxic wastes or substances.
- **ANPOOL -** Anchialine pool, underground pools with subsurface connections to watertable and ocean.
- **DOWN -** Downstream (i.e., within a potentially polluted area) from a facility which has a potential to pollute.
- **IMPDMT -** Impoundment. Includes waste pits, treatment lagoons, and settling and evaporation ponds.
- **STMSWR -** Storm water sewer.
- **LNDFL** - Landfill.
- **CMBMI -** Combined municipal and industrial facilities.
- **CMBSRC -** Combined source (intake and outfall).

Rationale - these descriptors potentially indicate a station location that at which an ambient water sample would not be obtained (i.e., such sampling locations are potentially biased) or the sample location is not located within one of the designated water body types (i.e, ANPOOL).

5. Station records were eliminated from data set if the station location did not fall within any established cataloging unit boundaries based on their latitude and longitude.

6. Using nutrient ecoregion GIS coverage provided by USEPA, all station locations with latitude and longitude coordinates were tagged with a nutrient ecoregion identifier (nutrient region identifiers are values 1 - 14) and the associated nutrient ecoregion name. Because no nutrient ecoregions exist for Alaska, Hawaii, and Puerto Rico, stations located in these states were tagged with "dummy" nutrient ecoregion numbers (20 = Alaska, 21 = Hawaii, 22 = Puerto Rico).

7. Using information provided by TVA, 59 station locations that were marked as 'stream' locations under the "Station Type" parameter were changed to 'reservoir' locations.

8. The nutrient data retrieved from STORET were assessed for the presence of duplicate data records. The duplicate data identification process consisted of three steps: 1) identification of records that matched exactly in terms of each variable retrieved; 2) identification of records that matched exactly in terms of each variable retrieved except for their station identification numbers; and 3) identification of records that matched exactly in terms of each variable retrieved except for their collecting agency codes. The data duplication assessment procedures were conducted using SAS programs.

Prior to initiating the data duplication assessment process, the STORET nutrient data set contained:

41,210 station records
924,420 sample records

- <u>Identification of exactly matching records</u>
  All data records were sorted to identify those records that matched exactly. For two records to match exactly, all variables retrieved had to be the same. For example, they had to have the same water quality parameters, parameter results and associated remark codes, and have the same station data item and sample data item information. Exactly matching records were considered to be exact duplicates, and one duplicate record of each identified matching set were eliminated from the nutrient data set. A total of 924 sample records identified as duplicates by this process were eliminated from the data set.

- <u>Identification of matching records with the exception of station identification number</u>
  All data records were sorted to identify those records that matched exactly except for their station identification number (i.e., they had the same water quality parameters, parameter results and associated remark codes, and the same station and sample data item information with the exception of station identification number). Although the station identification numbers were different, the latitude and longitude for the stations were the same indicating a duplication of station data due to the existence of two station identification numbers for the same station. For each set of matching records, one of the station identification numbers was randomly selected and its associated data were eliminated from the data set. A total of 686 sample records were eliminated from the data set through this process.

- <u>Identification of matching records with the exception of collecting agency codes</u>
  All data records were sorted to identify those records that matched exactly except for their collecting agency codes (i.e., they had the same water quality parameters, parameter results and associated remark codes, and the same station and sample data item information with the exception of agency code). The presence of two matching data records each with a different agency code attached to it suggested that one agency had utilized data collected by the other agency and had entered the data into STORET without realizing that it already had been placed in STORET by the other agency. No matching records with greater than two different agency codes were identified. For determining which record to delete from the data set, the following rules were developed:

  - If one of the matching records had a USGS agency code, the USGS record was retained and the other record was deleted.
  - Higher level agency monitoring program data were retained. For example, federal program data (indicated by a "1" at the beginning of the STORET agency code) were retained against state (indicated by a "2") and local (indicated by values higher than 2) program data.
  - If two matching records had the same level agency code, the record from the agency with the greater number of overall observations (potentially indicating the data set as the source data set) was retained.

  A total of 2,915 sample records were eliminated through this process.

As a result of the duplicate data identification process, a total of 4,525 sample records and 36 individual station records were removed from the STORET nutrient data set. The resulting nutrient data set contains the following:

41,174 station records
919,895 sample records

APPENDIX B. Process for Adding Aggregate Nutrient Ecoregions and Level III Ecoregions

The flag_id tracks the type of changes that were made to the data. There are a total of eight flags that are used to describe the changes made to the data. The flags are defined as follows:

1—The latitude and longitude coordinates match the county that was provided. If the HUC was null, it was updated based on the latitude and longitude coordinates. The ecoregions were determined by using the latitude and longitude coordinates.

2—The county and HUC are available, but the latitude and/or longitude coordinates are missing. Therefore, the centroid of the intersection of the county and HUC was used to determine the ecoregions and the latitude and longitude coordinates. If the HUC and county did not intersect, the county centroid was used to determine the ecoregions and the latitude and longitude coordinates.

3—The county is available, but the HUC and the latitude and/or longitude coordinates are missing. Therefore, the county centroid was used to determine the ecoregions, HUC, and the latitude and longitude coordinates.

4—The HUC is available, but the county is not and the latitude and/or longitude coordinates are missing. Therefore, the HUC centroid was used to determine the ecoregions, county, and the latitude and longitude coordinates.

5—The county is missing, but the latitude and longitude coordinates are available. Note: A county is considered missing if it is invalid. In other words, if the county entered did not exist in the state, it was considered null. Therefore, the latitude and longitude coordinates were used to determine the ecoregions, county, and HUC (if it was missing).

6—The latitude and longitude coordinates did not match the county that was provided, but they did match the HUC. Therefore, the county centroid was used to determine ecoregion values.

7—The latitude and longitude coordinates did not match the county or the HUC that was provided (including null HUCs). Therefore, the county centroid was used to determine ecoregion values.

8—The latitude and longitude coordinates were missing, but the ecoregions were provided by the state.
The ecoregions provided by the states were used as the ecoregion values.

APPENDIX C. Glossary

Coefficient of Variation - A measure of variability. The standard deviation divided by the mean multiplied by 100.

Maximum - The highest value.

Mean – A measure of central tendency. The arithmetic average.

Median – A measure of central tendency. The value which cuts the distribution in half, such that half of the values are above the median, and half of the values are below the median. Also called the 50th percentile or middle value.

Minimum - The lowest value.

Standard Deviation – A measure of variability. The square root of the variance with the variance defined as the sum of the squared deviations divided by the sample size minus one.

Standard Error - A measure of variability. The standard deviation divided by the square root of the sample size.

5^{th} % - the 5^{th} percentile

25^{th} % - the 25^{th} percentile, the first quartile.

75^{th} % - the 75^{th} percentile, the third quartile.

95^{th} % - the 95^{th} percentile